THE SINGER COMPANY SIMULATION PRODUCTS DIVISION

BINGHAMTON, NEW YORK

NASA CR

DRL No. 4 DRD No. CM-024TC

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> SMS Design Review Summary Report

"Preliminary" - NASA Approval Pending

NASA Contract NAS-9-14910 Type 1 Data

Date: April 30, 1976



REVISIONS	PREPARED BY (TYPE OR PRINT)	DATE	PREPARED BY (SIGNATURE)	DATE	CHECKED BY	DATE	APPROVED	DATE
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PAGE NO.

i

REP. NO.

FOREWORD

The Design Review Summary Report is prepared in sections, with each section representing a system or equipment development activity. The information contained in this document is required 10 days after the respective CDR's and PDR's. Since CDR's and PDR's are scheduled on an incremental basis, the Design Review Summary Report sections are prepared incrementally with the scheduled dates for associated CDR's and PDR's.

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PAGE NO. ii

REP. NO.

Design Review Summary Reports DRL Item 4, DRD CM-024TC

1. General

The Design Review Summary Report for the Shuttle Mission Simulator (SMS) are contained in separate sections of this document. These sections are generated individually for use during the design reviews held for the applicable systems of the SMS.

The sections of the SMS Design Review Summary Report are listed below:

Section 1 - Electrical Power System (EPS)

Section 2 - Mechanical Power System (MPS)

Section 3 - Main Prop and Ext. Tank

Section 4 - Solid Rocket Booster

Section 5 - Reaction Control System

Section 6 - Orbital Maneuvering System

Section ₹ - Guidance, Navigation & Control

Section 8 - Comm and Tracking Insts.

Section 9 - Env. Cont. & Life Support

Section 10- Data Processing System

Section 11- Mechanical System

Section 12- Payload Accommodation (Not Required)

Section 13- Vehicle Dynamic System

Section 14- Mission Control Center Interface

Section 15- Image Generation System

Section 16- Image Display System

REV. ORIGINAL

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PAGE NO. iii

REP. NO.

Section 17 - Image Processing & Control

Section 18 - Software Stds & Support Software

Section 19 - Utility Software

Section 20 - Crew Stations

Section 21 - Motion Base (Not Required)

Section 22 - Instructor Operator Stns

Section 23 - Digital Computer Complex

Section 24 - Signal Conv. & Ancillary

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PAGE NO. 1 of 2

REP. NO.

SMS-DRSR

Identifying Incremental Section Release Sheet

This release of the Design Review Summary Report contains Sections 20, 22, and 24. NASA W.P. #'s 20, 22, and 24. This is a partial release for WP #24, other increments will follow.

8-8-A

DATE 4/30/76
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PAGE NO.2 of 2

REP. NO.

DRL #4 DRD #CM-024TC

Section 20

Section 22

Section 24

1. General

These PDR's were held 4/20 and 4/21/76. This release contains all Program Directives written during the PDR's, as well as minutes, and handouts. Engineering documentation updates will be submitted under another letter.

2. Attendees

Personnel in attendance at the various PDR's are listed on page 1 of the respective PDR minutes. One set of signed-off minutes are enclosed for each PDR.

3. Program Directives

All Program Directives were dispositioned the day after PDR, and are included in this DRSR as completed directives.

4. Action Items

If an action item was assigned, it is listed in the respective set of PDR minutes.

POWER SYSTEM

PRELIMINARY DESIGN REVIEW MINUTES

APPROVATA

TOM GEREK

SECTION CHIEF

APPROVAL

BERT GIFFORD

TEAM LEADER

Power PDR

Attendees:

Bruce Stach, P.T.
Charles Olasky, P.T.
Robert Meyers, P.T.
Cliff Mire
Bert Gifford
K. Hickling, P.T.
P. Valochovic, P.T.

Glenn Hiser
Tom Gerek
Abe Ulangca
Fred Carver
B. Steckert, P.T.
G. Chiesa, P.T.

P.T. - Part Time

Discussion:

Tom Gerek presented an overview of the SMS powersystem and turned the meeting over to Fred Carver for detail presentation.

A revised EDR figure 4.6.1.2, overheat warning, was handed out (see Attachment 1) as well as an overall bus configuration (see Attachment 2).

Discussions began on EDR figure 4.1.1. A question was asked concerning the CB rating. SPD answered that the current rating was based on information listed in the Data Book.

NASA asked whether the FBCS/MBCS power was separate as required by the SOW. SPD responded that the power control was separate even though it is a common power cabinet. Emergency OFF will shut down both complexes, however.

NASA asked if Emergency OFF will drop air conditioners and MBCS lift platform. (Ref: EDR figure 4.1.2). SPD answered these were not affected by Emergency OFF.

NASA asked if the NSS capability was included in this PDR package. SPD answered not at this time; when the design concept becomes firm, the documentation will be updated. Present plans appear to require another bus system which may require a larger cabinet.

SPD presented the power sequencing (Ref: EDR figure 4.2.1):

- Normal/Disable Must be in Normal
- 2. Manual Must be held for 5-7 seconds
- 3. System ON Allows power to power cabinet logic
- 4. Contactor

Switches - Apply power to individual pieces of equipment.

SPD presented the grounding philosophy (Ref: EDR figure 4.4.1) SPD questioned the facility ground, i.e., should the neutral and chassis/signal grounds be separated in the PDU. NASA stated that

Power PDR Page 2

Building 5 has separate earth grounds, but this earth ground may not be tied back to transformer ground. This may cause a ground potential difference between neutral and chassis/signal ground if they are not tied together in the PDU.

Action: SPD 1 - Measure the ground potential of the earth/neutral grounds.

Discussion ensued on grounding of cabinets. The X-T recorder was discussed. NASA requested that the chassis ground be returned to the power cabinet in the power cable.

Action: NASA 1 - Inform SPD as to whether the 400 Hz power is ground isolated or not.

SPD presented the Emergency OFF System (Ref: EDR figure 4.5.1). Discussion ensued on the Emergency OFF availability/motion disable availability in the Crew Station. NASA generated Program Directive N24-001P. Computers and SID will be dumped when Emergency OFF is activated. Emergency OFF switches are unlighted.

EDR figure 4.6.1.2 (Overheat Detection System) was discussed. SPD stated that there are overheat detectors located in areas where DC power supplies are housed. Lights on cabinets & OS will illuminate and trigger aural alarm when overheat condition exists or test switch on OS is depressed. The DU airflow sensors are also connected to the Overheat Warning System.

EDR figure 4.6.1.1, Overheat Detection Circuitry, was shown and discussed.

Visual power and grounding system is separate and will be discussed during the Visual System PDR.

Discussion of the CEI was held to make the CEI's to be 1 Book with various sections for each end item. All the boilerplate items would be included only once and each section would address the unique items for each work package.

The following comments were discussed concerning the boilerplate areas:

a. Paragraph 2.0, Applicable Documents

Singer will take action item to clarify the wording so there will be no conflict with the SOW Addendum A.

b. Paragraph 3.3.3

Remove the comment concerning the power connectors and add to the pwoer unique section.

Power PDR Page 3

c. Paragraph 3.3.3

Add the sentence, "Commercial.....process" from SMS Addendum A, Paragraph 3.4.3.1.

d. Paragraph 3.3.3.1

Remove the last sentence.

e. Paragraph 3.3.7

Change MIL-D-1000 to MIL-STD-100.

f. Paragraph 3.3.9

Singer will take an action item to decide what specification it will abide by and present to NASA for approval.

Action: SPD 2 - Inform NASA of EMI specifications used for SMS design.

Action: NASA 2 - Define whether a similar CEI documentation concept can be applied to the CPCEI's.

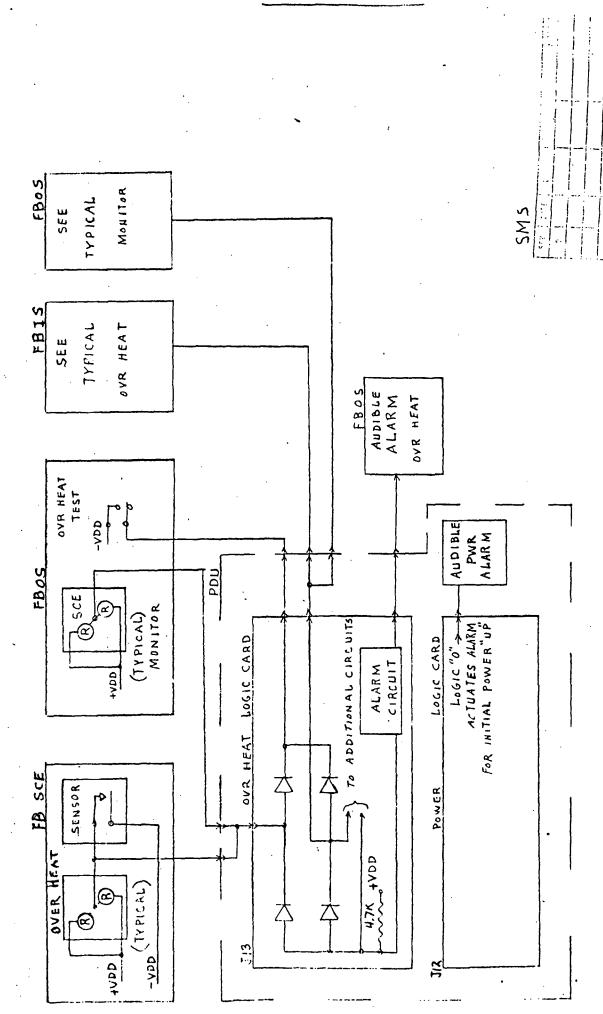
Singer will change Paragraph 4.1.1.2 of CEI to read: "Using visual inspection and voltmeter, verify that the correct power is supplied to various hardware items to ensure proper distribution prior to connecting the cables."

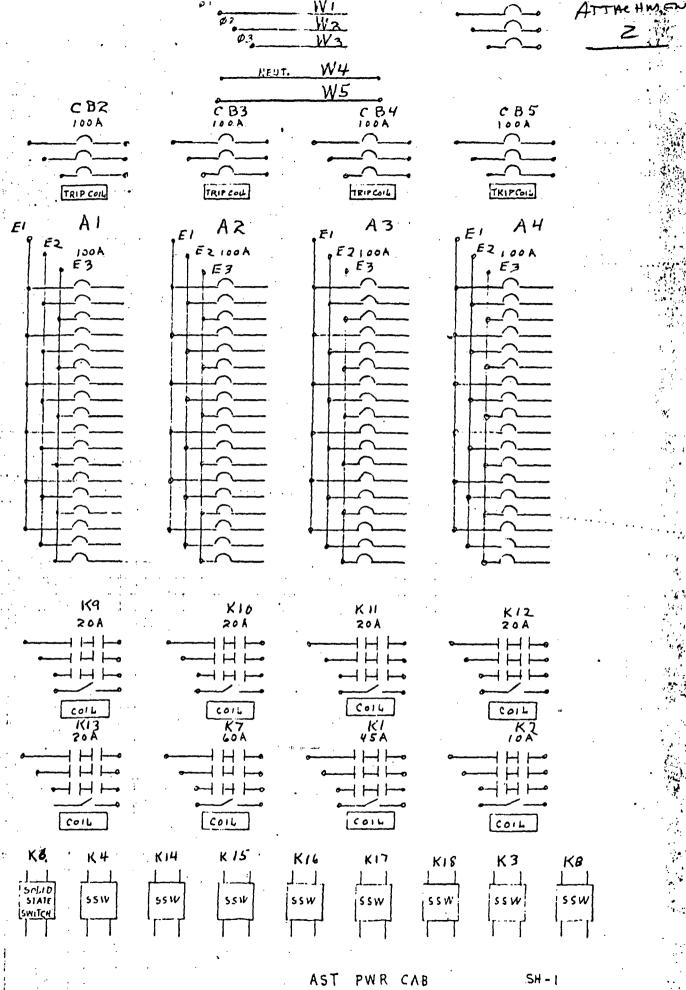
The Data Book was discussed without any comments.

NASA worte RID's N24-001P, N24-002), N24-003), included at Attachments 3. 4 and 5, respectively.

SYSTEM

TYPICAL





AST PWR CAE

8-27-75

ATTACHMENT S					
- SINS PROGRAM DIRECTIVE					
1. INITIATOR	ORGANIZATION	DATE	NO.		
B. M. Gifford	NASA	4/20/76	N24-001P		
Crew Station Power Interlo	cks	. ,	:		
Z. DESCRIPTION OF PROBLEM.			· 		
Current design has the onl console (total emergency point of the console of the c	ower off only sire for quic	y). This cou ck motion tur	ld result		
3. RECOMMENDATION.					
Install permanent emergence station. Install an emerge MBCS.					
4. IMPACT, IF RECOMMENDATION NOT IMPLEMENTED:		·			
Potential operating proceduoff MB hydraulic system wou					
5. CONCURRENCE					
WBS MANAGER BM GMA	TEAM LEADER	3m Gillind			
6. DISPOSITION) (
Approved Disapproved Withdrawn Tech. Direction X Contractor's Impact Statement Req.					
COMMENTS: Melaffers					
APPROVAL					
L. CLUCKY		DATE 4/21/16			
7. CONTRACTOR'S AMPACT STATEMENT.					
Cost impact probably over \$	2,000. No s	chedule impac	et.		
LE AM yhipa UBu	ew~ 4/21/1	6			
B. SCP ACTION.		·			
Dies					
APPROVAL					
SCP CHAIRMAN MED M		DATE	22/16		

<u></u>		A Tr	FE. HIMEWI 7
- SMS	PROGRAM DIRE	CTIVE	
1. INITIATOR	ORGANIZATION	DATE ,"	No.
B. M. Gifford	NASA	4/20/76	N24-002P
Air Conditioning Eme	rgency Off		1
2. DESCRIPTION OF PROBLEM			
Design does not include Base lift platform in E			ing or Motion
			• •
3. RECOMMENDATION:			
Add Emergency Off conta lift power circuits.	ctors to air co	onditioning a	nd platform
4. IMPACT, IF RECOMMENDATION NOT IMPLEMENT			
Emergency Off is initial lift platform and contiinitiated. 5. CONCURRENCE			
WBS MANAGER	TEAM LEAD	ER BM GN	n el
6. DISPOSITION			
Approved Tech. Directi	Olisapproved on X Contractor's	Withd s Impact Statement Re	*
COMMENTS:			
APPROVAL TECHNICAL MANAGER		DATE	
1. Clarky (S)	·	DATE/21/	16
7. CONTRACTOR'S AMPACT STATEMENT!		•	
Cost impact under \$2000	. No schedule i	impact.	
(E Hall 4/21/14	leBrown	,4121/16	
B. SCP ACTION C		i	
			·
APPROVAL			
SCP CHAIRMAN		DATE	
		1	

			THANKIER !		
SMS P	ROGRAM DIRECT	IVE	,		
1. INITIATOR .	ORGANIZATION	DATE "	NO.		
B. M. Gifford	NASA	4/20/76	N24-003P		
PDV Trippable Breaker I	Load Assignme	nts	1		
2. DESCRIPTION OF PROBLEM:					
Motion Base and Fixed Base four trippable breakers.	e loads are d	istributed an	nong the		
3. RECOMMENDATION:					
Redistribute power loads s and Motion Base units are trippable breakers.	such that when powered throu	ce possible, igh separate	Fixed Base 100A		
4. IMPACT, IF RECOMMENDATION NOT IMPLEMENTED:					
Tripping of a single 100A trippable breaker will disable both the Motion Base and Fixed Base simulations.					
5. CONCURRENCE WBS MANAGER	TEAM LEADER	_5.50 0			
BM Gillar		sm Gylind			
6. DISPOSITION Approved	Disapproved	- Withda	240		
Approved Disapproved Withdrawn Tech. Direction X Contractor's Impact Statement Req.					
COMMENTS					
	:				
TECHNISAL MAYACER		DATE 4/21/7	6		
7. CONTRACTOR'S IMPACT STATEMENT.					
No cost of schedule impact	•				
LE Shall ypeps	eBrau	4/21/16			
8. SCP ACTION:	•	:·			
•	•	,			
<i>;</i>					
APPROVAL		•			
SCP CHAIRMAN		DATE			
			•		

INSTRUCTOR/OPERATOR STATIONS

PRELIMINARY DESIGN REVIEW MINUTES

APPROVAL:

TOM GEREK

SECTION CHIEF

APPROVAL:

BERT GIFFORD TEAM LEADER

Attendees

R. Follert
D. Bailey
C. Mortimer
L. Hershey
C. Olasky
B. Stach
T. Gerek
A. Ulangca
B. Gifford
R. Myers
R. Farley

Tom Gerek began the presentation by stating the scope of the PDR. He then introduced R. Follert who presented the IS/OS console frame design.

Cliff Mire asked that SPD review the shelf framing to insure there are no sharp protrusions.

A revised IS panel layout and function list was presented (Attachment l and lA). The revision was due to the fact that the TAC CRT's could not be mounted in 2 bays as originally anticipated.

NASA wrote RID N22-001P (Attachment 2).

SPD presented the OBS design approach and transmitted RID S22-001P (Attachment 3).

SPD presented the MBCS console for the OBS (same as OAS except for modifications to accept new CRT).

SPD stated, in response to NASA questions, that the FBCS OBS will block the payload station and portions of the aft center panels in the FBCS. NASA wrote RID N22-02P (Attachment 4).

SPD presented the FBCS & MBCS IS panel layout.

SPD stated that the visual select switch is not shown on the panel layout. This switch will be mounted on the same panel as the visual monitor.

NASA questioned the requirement for a freeze repeater on panel 3C when the control is located adjointly on panel 4C. SPD responded that this was OAS design.

NASA questioned the visual system status on panel 4C - it does not reflect the DIG system.

Action: SPD-1 - Define the visual system status.

Discussion ensued on the major equipment status on the OS. NASA questioned the "power on" light and requested SPD to evaluate the effectiveness of this light.

NASA wrote RID N22-007P (Attachment 5).

Discussion on the ISA panel was differed until discussion on the light pen approach.

NASA wrote RID on N22-003P, N22-004P, N22-005P - (Attachments 6, 7, & 8).

SPD presented the Graphic Display system configuration.

NASA questioned the EDR data that depicted the hardcopy capability as coming only from "system B'. SPD stated that the system B hardware preforms the hardcopy but via software control from system A & C.

SPD presented an alternate hardcopy technique which deletes the video tape recorder. RID S22-002P was generated (Attachment 9 & 9A).

Discussion was held on the Aydin Alphanumeric CRT system.

SPD stated that each A/N CRT does meet the HEW requirements. NASA asked if collectively do they meet the HEW requirement to which SPD stated this information was not available.

Action: SPD-2 - Provide NASA with the data for the Alphanumeric CRT radiation information that Aydin has on file.

C. Mortimer discussed an option for use of the shadow mask Conrac CRT in lieu of the proposed Aydin CRT.

NASA wrote RID N22-009P (Attachment 10).

SPD presented options to add an expanded keyboard (45 additional keys) and light pen (Attachment 11). If these options are purchased by NASA they would remove the ISA Switch and CRT selection switchlight matrix.

SPD wrote RID's S22-003P, S22-004P (Attachments 12 & 13).

SPD stated that the SMS color scheme will be the same as the present OAS scheme. NASA had no comments. NASA noted that there were no provisions for the SMS IOS back-up communications loop. NASA wrote RID N22-008P (Attachment 14).

At this time R. Meyers requested the addition of an Abort, Master Alarm and Record in progress status light at the Instructor Stations.

NASA wrote RID N22-006P (Attachment 15).

The CEI specification was reviewed with the following comments:

- a) Para. 3.1.1.1 SPD to provide more detail on panels.
- b) Para. 3.1.1.2 SPD to provide better definition of CRT system requirements.
- c) Para. 3.1.1.2.3 Change the "right hand crew member" to left hand crew member".
- d) Para. 3.1.1.4 Change "(3) for FBCSS" to "(6) for FBCSS".
- e) Para. 3.2.1 Add SCE and computers to the interface requirements.
- f) Update figures to the ones presented at PDR.

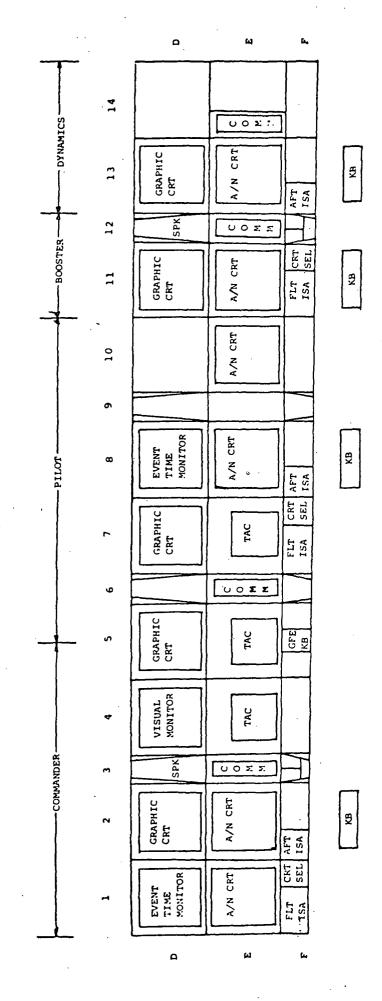


FIGURE 3.1-3 PANORAMIC VIEW OF THE MBIS CONSOLE

ATTACHMENT I

FBIS/MBIS/FBOS/MBOS/OBS FUNCTION LIST

TABLE OF CONTENTS

PANEL	FBIS	PANEL	FBIS
lA		9C	
18		10A	
ıc	1, 2	10B	
2A		100	
28	•	11A	63
2C	4	11B	
3A	15, 16	11C	1, 2, 6
3B		12A	15, 16
3C	6-10, 62	12B	
4A	63	12C	7-10, 62
4B		13A	
4C	7, 49, 54, 55, 57, 58, 60, 61	13B	
5A		13C	4
5B		14A	
5C		14B	
6A		14C	
6B		PANEL	MBIS
6C		10	
7A		lE	
7B	-	lf	1, 2
7C	1, 2, 6	2D	
8A		2E	
8B	•	2F	5
8C	4	3D	15, 16
9A		3E .	
9в		3F	6-10, 62

•			ii
PANEL	MBIS	PANEL	MBIS
4D	63	13E	·
4E		13F	5
4F	7, 49-55, 57-61	14D	,
5D		14E	
5E		14F	
5 F .		PANEL	FBOS
6D		21A	
. 6E		21B	
6F		21C	8-14, 18-25, 54
7D		22A	63
7E		22B.	15, 16, 17
7F	1, 2, 6	22C	48, 49, 54, 55, 57, 58, 60, 61, 62
8D		23A	
8E		23B	
8 F	5	23C	1, 3, 6
9D		24A	4, 63
9E		24B	}
9F		24C	
100		PANEL	MBOS
10E		21D	
10F		21E	
11D		21F	8, 9, 10, 11, 12, 13, 14, 18-47
ļļE			63
11F	1, 2, 6	22D	
12D	15, 16	22E	15, 16, 17
12E		22F	48-62
12F	7-10, 62	23D	
13D		23E	

PANEL

MBOS

23F

6

24D

24E

24F

1, 3, 5

PANEL

OBS-FB

41A

41B

7, 11, 12, 48-57, 62

Panels 1C, 1F, 7C, 7F, 11C, 11F, 23C and 23F

PANEL TITLE

FLT STA

NOMENCLATURE

(ISOMORPHIC SWITCH ARRAY - c.f. FIGURE 3.1-11)

COLOR

White

TYPE

Switches (65) - not illuminated

FUNCTION

Each of these switches represents a flight station panel, part of a panel, or a group of panels as defined by NASA.

COMMENTS

The switches are arranged to have a similar spatial relationship on the console panel as their corresponding counterparts in the cockpit have. Activation of a particular switch will result in a CRT display of the appropriate NASA-defined panel pages.

Panels 1C, 1F, 7C, 7F, 11C and 11F

PANEL TITLE

CRT SELECTION (FBIS AND MBIS)

NOMENCLATURE

EVENT TIME CMDR, GRAPH CRT CMDR, A/N CRT CMDR, A/N CRT CMDR, GRAPH CRT PILOT, GRAPH CRT PILOT, EVENT TIME PILOT, A/N CRT PILOT, A/N CRT PILOT, GRAPH CRT BOOST, GRAPH CRT DYNAM, EVENT TIME DYNAM**, A/N CRT BOOST & 'A/N CRT DYNAM.

COLOR -

White

TYPE

Switches (14) - 3C, 7C and 12C - not illuminated Switches (13) - 3F, 7F and 12F - not illuminated

FUNCTION

These switches allow the user to direct subsequent requests for displays and hard copies of the CRT's designated by the switches.

COMMENTS

These switches are found on the instructor stations.

These switches are used in conjunction with the ISA (FLT STA and AFT STA) to secure a display or a hard copy of the designated CRT. It is not necessary to redesignate (activate the switch corresponding to the appropriate CRT) the same CRT if it is to be used for sequential displays or hard copies.

The switches are arranged in a special relationship similar to that of the actual CRT's in the individual instructors' working areas.

**On FBIS only.

TOCATION

Panels 23C and 23F

PANEL TITLE

CRT SELECTION (FBOS AND MBOS)

NOMENCLATURE

GRAPH CRT CONTR, A/N CRT CONTR, GRAPH CRT COORD, AND A/N CRT COORD (c.f. FIGURE 3.1-16)

COLOR

White

TYPE

Switches (4) - not illuminated

FUNCTION

These switches allow the user to direct subsequent requests for displays and hard copies of the CRT's designated by the switches.

COMMENTS

These switches are found on the operator stations.

These switches are used in conjunction with the ISA (FLT STA and AFT STA) to secure a display or a hard copy of the designated CRT. It is not necessary to redesignate (activate the switch corresponding to the appropriate CRT) the same CRT if it is to be used for sequential displays or hard copies.

The switches are arranged in a spacial relationship similar to that of the actual CRT's in the individual operators' working areas.

Panels 2C, 8C, 13C and 24C

PANEL TITLE

AFT STA (FBIS AND FBOS)

(ISOMORPHIS SWITCH ARRAY, c.f., FIGURE 3.1-13)

NOMENCLATURE

COLOR

White

TYPE

Switches (39) - not illuminated

FUNCTION

COMMENTS

These switches are found on the fixed base consoles only.

The switches are arranged to have a similar spacial relationship on the console panel as their corresponding counterparts in the cockpit have. Activation of a particular switch will result in a CRT display of the appropriate NASA-defined panel pages.

Panels 2F, 8F, 13F and 24F

PANEL TITLE

AFT STA (MBIS AND MBOS)

NOMENCLATURE

(ISOMORPHIC SWITCH ARRAY, c.f. FIGURE 3.1-14)

COLOR

White

TYPE

Switches (21) - not illuminated

FUNCTION

Each of these switches represent an Aft Station panel, part of a panel, or a group of panels as defined by NASA.

COMMENTS

These switches are found on the motion base consoles only.

The switches are arranged to have a similar spacial relationship on the console panel as their corresponding counterparts in the cockpit have. Activation of a particular switch will result in a CRT display of the appropriate NASA-defined panel pages.

Panels 3C, 3F, 7C, 7F, 11C, 11F, 23C and 23F

PANEL TITLE

CRT SELECTION

NOMENCLATURE

HARD COPY

COLOR

White

TYPE

Switch (1)

FUNCTION

When tripped, this switch will produce a hard copy of the display on the designated CRT (last CRT selected).

COMMENTS

This switch is found on all CRT selection panels of both the instructor and operator stations. Used in conjunction with the ISA (FLT STA and AFT STA) a hard copy of the designated CRT is requested by tripping the hard copy switch. It is not necessary to redesignate the same CRT if it is to be used for sequential displays or hard copies.

Panels 3C, 3F, 4C, 4F, 12C, 12F, 31B and 41B

PANEL TITLE

FREEZE

NOMENCLATURE

FREEZE

COLOR

White

TYPE

Switchlight (1) - 3C, 3F, 11C, 11F, 31B and 41B. (FBIS, MBIS, FBOS, MBOS, AND OBS).

Indicator light (1) - 4C and 4F (FBIS and MBIS)

FUNCTION

The switchlight will stop the simulator at any point when tripped. The indicator light will light when the simulator is in a freeze condition.

COMMENTS

The simulator will freeze automatically when predetermined simulator conditions have been exceeded. The parameters that have been exceeded will be displayed on the CRT.

Panels 3C, 3F, 12C, 12F, 21C and 21F

PANEL TITLE

LIGHTING

NOMENCLATURE

CONSOLE INT

· COLOR

Matte black with white pointer

TYPE

Skirted control knob (1)

FUNCTION

This continuously variable control permits the instructors and operators to set the console lighting intensity at an appropriate level.

COMMENTS

Panels 3C, 3F, 12C, 12F, 21C, and 21F

PANEL TITLE

LIGHTING

NOMENCLATURE

IND LAMP INT

COLOR

Matte black with white pointer

TYPE

Skirted Control Knobs

FUNCTION

This continuously variable control permits the instructors or operators to set the intensity of the indicator lights on the associated portion of the console.

COMMENTS

Panels 3C, 3F, 12C, 12F, 21C and 21F

PANEL TITLE

LIGHTING

NOMENCLATURE

LAMP TEST LEFT and LAMP TEST RIGHT

COLOR

White

TYPE

Switchlights (2)

FUNCTION

The activation of either the lamp test left or lamp test right switchlight will illuminate all indicator lamps on that portion of the console.

COMMENTS

To avoid excessive power supply loading during lamp test, the IS and OS consoles are divided into sections for lamp test. Each section will contain an integral number of panels (i.e., no panels test from more than one location). Lamp power for IS and OS lighting will come from remotely programmable power supplies. Individual supplies will be provided for each of these sections. Each IO and OS light will have a dedicated relay as that lamp test will not affect cockpit operation.

Panels 21C, 21F and 41B

PANEL TITLE

AURAL CUE

NOMENCLATURE

AURAL VOLUME - (MIN-MAX)

COLOR

Matte black with white pointer

TYPE

Skirted Control Knob (1)

FUNCTION

This continuously variable control permits the operator to control the volume of the aural cue system.

COMMENTS

Panels 21C, 21F and 41B

PANEL TITLE

AURAL CUE.

NOMENCLATURE

AURAL ON

COLOR

White

TYPE

Switchlight (1)

FUNCTION

This switchlight turns the aural cue system on and off.

COMMENTS

Panels 21C and 21F

PANEL TITLE

AURAL CUE

NOMENCLATURE

WARN VOLUME - (MIN-MAX)

COLOR

Matte black with white pointer

TYPE

Skirted Control Knob (1)

FUNCTION

This continuously variable control permits the operators to control the volume of the caution and warning system.

Panels 21C and 21F

PANEL TITLE

AURAL CUE

NOMENCLATURE

WARN ON

COLOR

White

TYPE

Switchlight (1)

FUNCTION

This switchlight turns the caution and warning system on and off.

Panels 3A, 3D, 12A, 12D, 22B and 22E

PANEL TITLE

(SPEAKER)

NOMENCLATURE

SPEAKER VOLUME (MIN-MAX)

COLOR

Matte black with white pointer

TYPE

Skirted Control Knob (1)

FUNCTION

This continuously variable control permits the instructors and operators to set the intensity of sound through the speakers at appropriate levels.

Panels 3A, 3D, 12A, 12D, 22B and 22E

PANEL TITLE

(SPEAKER)

NOMENCLATURE

SPEAKER ON

COLOR

White

TYPE

Switchlight (1)

FUNCTION

This control turns the adjacent speaker on and off.

Panels 22B and 22E

PANEL TITLE

(SPEAKER)

NOMENCLATURE

AURAL CUE

COLOR

White

TYPE

Switchlight (1)

FUNCTION

This switch, when activated, sends aural cue sound through the speakers at the IS and OS provided that the speakers are turned on.

Panels 21C and 21F

PANEL TITLE

VISUAL SYSTEM STATUS

NOMENCLATURE

DC POWER ON - VIS POWER CAB, GANTRY CONTRL CAB, CAMERA CAB, XMSN CAB,

DISPL POWER CAB #1, AND DISPL POWER CAB #2.

COLOR

White

TYPE

Indicator lights (6)

FUNCTION

When illuminated, these lights indicate that DC power is on at the designated visual system cabinets.

Panels 21C and 21F

PANEL TITLE

VISUAL SYSTEM STATUS

NOMENCLATURE

OVERHEAT - VIS POWER CAB, GANTRY CONTRL CAB, CAMERA CAB, XMSN CAB, DISPL POWER CAB #1, DISPL POWER CAB #2, MODE ILLUM, AND 15 TBD ON

FBOS AND 5 TBD ON MBOS.

COLOR

Yellow

TYPE

Indicator lights (22) - 21C (FBOS) Indicator lights (12) - 21F (MBOS)

FUNCTION

When illuminated, these lights indicate an overheat condition in the designated visual system cabinet. These lights will remain lighted until the overheat condition is corrected.

COMMENTS

When an overheat occurs, an alarm bell will sound (c.f. BELL OFF -NEXT PAGE)

TOCATION

Panels 21C and 21F

PANEL TITLE

VISUAL SYSTEM STATUS

NOMENCLATURE

BELL OFF

COLOR

White

TYPE

Switchlight (1)

FUNCTION

This switchlight permits the operator to turn off the overheat alarm bell. Once activated, this switchlight will remain lighted until the overheat condition is corrected.

Panels 21C and 21F

PANEL TITLE

VISUAL SYSTEM STATUS

NOMENCLATURE

MAINT SEL - GANTRY CONTRL CAB, CAMERA CAB, and XMSN CAB

COLOR

White

TYPE

Indicator lights (3)

FUNCTION

When illuminated, these indicator lights denote the maintenance mode has been selected at the designated cabinet.

Panels 21C and 21F

PANEL TITLE

VISUAL SYSTEM STATUS

NOMENCLATURE

GANTRY STATUS - OVERSPEED, GANTRY IN LIMIT and PROBE PROTECT

COLOR

Yellow

TYPE

Indicator lights (3)

FUNCTION

When illuminated, these lights provide a warning of gantry status conditions.

Panels 21C and 21F

PANEL TITLE

SIMULATOR STATUS

NOMENCLATURE

BELL OFF

COLOR

White

TYPE

Switchlight (1)

FUNCTION

This switchlight permits the operator to turn off the overheat alarm bell. Once activated, this switchlight will remain lighted until the overheat condition is corrected.

Panels 21C and 21F

PANEL TITLE

SIMULATOR STATUS

NOMENCLATURE

CS BLOWRS OFF, and ONE TBD

COLOR

Yellow

TYPE

Indicators Lights (2)

FUNCTION

When illuminated, these lights indicate that the crew station and instructor station blowers associated with the MCDS system are not operating.

Panels 21C and 21F

PANEL TITLE

SIMULATOR STATUS

NOMENCLATURE

OVERHEAT - OPER STA, INSTR STA, CREW STA, PDU, ICU and MOTION ELECTR**

COLOR

Yellow

TYPE

Indicator Lights (6)

FUNCTION

When illuminated, these lights indicate an overheat condition in the designated cabinet. These lights will remain lighted until the overheat condition is corrected.

COMMENTS

When an overheat occurs, an alarm bell will sound.

**MBOS only - TBD on FBOS

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

AUTO/MAN

COLOR

White

TYPE

Indicator Light (Split Screen)

FUNCTION

Indicates that the motion system is in either the manual or the automatical control mode.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

DC VOLT SENSE

COLOR

Yellow

TYPE

Indicator Light (1)

FUNCTION

When illuminated, indicates that the DC power supply is out of tolerance.

TOCALLON

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

CYL TRACK ERROR

COLOR

Yellow

TYPE

Indicator Light (1)

FUNCTION

When illuminated, indicates that servo error is out of tolerance.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

MOTION EXCURS LIMITS

COLOR

Yellow

TYPE

Indicator Light (1)

FUNCTION.

Illuminates whenever any actuator approaches within 1/2" of its travel limit.

TOCATION

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

SETTLD POS

COLOR

Yellow

TYPE

Indicator Light (1)

FUNCTION.

Indicates that the platform is not in the settled position as commanded.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

ON/OFF

COLOR

White

TYPE

Indicator Light (Split Screen) (1)

FUNCTION

This light idicates that motion system power is on or off.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

AC PWR/DC PWR

COLOR

White

TYPE

Indicator Light (Split Screen) (1)

FUNCTION

This light indicates that AC and DC power have been turned on.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

SIGNAL XFR

COLOR

Yellow

TYPE

Indicator Light (1)

FUNCTION

This light illuminates when signal transfer is not occurring properly.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

PLATFORM - ENABLE/DN CMD

COLOR

TYPE

Indicator Light (1)

FUNCTION

ENABLE indicates that the motion base is settled and that the lift platform can be operated.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

PERIPHERAL EQUIPMENT - AUTO/MANUAL

COLOR

White

TYPE

Indicator Light (Split Screen) (1)

FUNCTION

Indicates that the peripheral equipment is in the automatic or manual mode.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

CMPTR PRGRM CHECKS

COLOR

Yellow

TYPE

Indicator Light (1)

FUNCTION

This light illuminates when the computer program check is not satisfactory.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

PERIPHERAL EQUIP

CMPTR LINKAGE CHECKS

COLOR

Yellow

TYPE

Indicator Light (1)

FUNCTION

This light illuminates when the computer check of the linkage is not satisfactory.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

MANUAL CONTROL PUMP START/STOP

COLOR

White

TYPE

Indicator Light (Split Screen) (1)

FUNCTION

This light indicates the start or stop condition of the pump in the manual control mode.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

MANUAL CONTROL ERECT/SETTLE

COLOR

White

TYPE

Indicator (Split Screen) (1)

FUNCTION

This light will illuminate when in the manual control mode the erect or settled condition of the motion base is realized.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

MANUAL CONTROL - SYSTEM CONTROL

MAINT and PERIPH

COLOR

White

TYPE

Indicator Lights (2)

FUNCTION

These lights indicate the position of the key-switch on the

motion cabinet.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

PUMP CONTROL

SIM AUTO, SIM MAN, and MAINT PANEL

COLOR

White

TYPE

Indicator Lights (3)

FUNCTION

These lights indicate the pump control mode.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

PUMP -

FILTER

COLOR

Yellow

TYPE

Indicator Light (1)

FUNCTION

When illuminated, this light indicates the need for filter maintenance.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

PUMP -

MOTION PUMP 1 and MOTION PUMP 2

COLOR

White

TYPE

Indicator Lights (2)

FUNCTION

Illumination of either of these lights indicates that the corresponding pumps have been turned on.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

PUMP -

HYDR FLUID LEVEL

COLOR

Yellow

TYPE

Indicator Light (1)

FUNCTION

Illumination of this light indicates that the hydraulic fluid has dropped below its normal level.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

PUMP -

HYDR FLUID TEMP

COLOR

Yellow

TYPE

Indicator Light

FUNCTION

Illumination of this light indicates that the hydraulic fluid temperature is in excess of 150° F.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

MOTION BASE HYDRAULICS -

1 FLTR/4 FLTR, 2 FLTR/5 FLTR, 3 FLTR/6FLTR, and 7 FLTR

COLOR

Yellow

TYPE

Indicator Lights (4) (Split Screens)

FUNCTION

Illumination of any of these lights indicates the corresponding filter needs maintenance.

Panel 21F

PANEL TITLE

MOTION SYSTEM STATUS

NOMENCLATURE

MOTION BASE HYDRAULICS
MOTION MNFOLD PRESS

COLOR

Yellow

TYPE

Indicator Light

FUNCTION

Illumination of this light indicates loss of pressure at motion distribution manifold.

Panels 22C, 22F and 41B

PANEL TITLE

SIM MODE

NOMENCLATURE

OBS CONT

: COLOR

White

TYPE

Switch (1) - 22C and 22F

Indicator Light (1) - 31B and 41B

FUNCTION

Activation of the OBS CONT switchlight by either operator transfers control from that operator's console to his respective in-cockpit observer's console. When an observer has control, the OBS CONT indicator light on the observer's station and the switchlight on the operator's station will be illuminated.

Panels 4C, 4F, 22C, 22F and 41B

PANEL TITLE

SIM MODE (FBOS, MBOS and OBS)
SIM MODE STATUS (FBIS and MBIS)

NOMENCLATURE

IS ACTIVE

COLOR

White

TYPE

Indicator Light (1) - 4C, 4F and 41B (FBIS, MBIS and OBS)
Switchlight (1) - 22C and 22F (FBOS and MBOS)

FUNCTION

The operators' switchlights, when activated, permit the instructor to make command inputs in lieu of the crew station. These command inputs are entered via the CRT and keyboard for both continuous control and switch positions. Displays will be active at both the instructor and crew stations during this mode of operation. In addition, the instructor's "in-cockpit keyset" (Panel 4C - FBIS, Panel 5F - MBIS), is active during this mode.

TOCATION

Panels 4F, 22F and 41B

PANEL TITLE

MOTION SYSTEM (MBOS and OBS) MOTION SYSTEM STATUS (MBIS)

NOMENCLATURE

MOTION ON

COLOR

White

TYPE

Indicator Light (1) - 4F (MBIS)
Switchlight (1) - 22F and 41B (OBS-MB)

FUNCTION

This switchlight activates the motion system provided the interlocks are satisfied. The motion platform will erect to its neutral position prior to responding to flight control inputs. The indicator light at the MBIS indicates that the motion system has been activated.

COMMENTS

The switchlight will be provided with clear, spring-loaded plastic covers to protect this control from inadvertant actuation.

Panels 4F, 22F and 41B

PANEL TITLE

MOTION SYSTEM (OS and OBS) MOTION SYSTEM STATUS (IS)

NOMENCLATURE

MOTION OFF

COLOR

White

TYPE

Indicator Light (1) - 4F (MBIS)

Switchlight (1) - 22F and 41B (MBOS and OBS-MB)

FUNCTION

This switchlight deactivates the motion platform. The motion platform returns to the neutral position prior to returning to the completely settled position. The indicator light at the MBIS indicates that the motion system has been deactivated.

COMMENTS

The switchlight will be provided with clear, spring-loaded, plastic covers to protect this control from inadvertent actuation.

Panels 4F, 22F and 41B

PANEL TITLE

MOTION SYSTEM (MBOS and OBS-MB)

MOTION SYSTEM STATUS (MBIS)

NOMENCLATURE

EXT PITCH

COLOR

White

TYPE

Indicator Light (1) - 4F (MBIS)

Switchlight (1) - 22F and 41B (MBOS and OBS-MB)

FUNCTION

The switchlights permit rotation of the cockpit to the launch position. The status of the extended pitch switch is repeated at the MBIS.

COMMENTS

This switchlight will be provided with a clear, spring-loaded plastic cover to protect from inadvertent actuation.

TOCATION

Panels 4F, 22F and 41B

PANEL TITLE

MOTION SYSTEM (MBOS and OBS-MB)
MOTION SYSTEM STATUS (MBIS)

NOMENCLATURE

INTERLOCKS -

THRML CUTOUT, RAMP, DOOR AND MAINT.

COLOR

Yellow

TYPE

Indicator Lights (4) - MBIS

FUNCTION

These indicator lights illuminate to indicate that the corresponding motion interlock is open. The motion platform will not be operable until the interlock is satisfied.

Panels 4C, 4F, 22C, 22F and 41B

PANEL TITLE

VISUAL SYSTEM

NOMENCLATURE

VISUAL AVAILABLE

COLOR

White

TYPE

Indicator Light (1)

FUNCTION

This indicator light illuminates when visual system power is on and indicates that the visual system is ready to operate.

Panels 4C, 4F, 22C, 22F and 41B

PANEL TITLE

VISUAL SYSTEM (FBOS, MBOS, and OBS-MB)

VISUAL SYSTEM STATUS (IS) - (FBIS and MBIS)

NOMENCLATURE

OPER/IN RESET

COLOR

White

TYPE

Indicator Light (1) (Split Screen) - 4C and 4F (FBIS and MBIS)
Switchlight (1) (Split Screen) - 22C, 22F and 41B (FBOS, MBOS and OBS-MB)

FUNCTION

This switchlight activates the visual system and slews the probe to the commanded position. The lower half of this control (IN RST) remains illuminated until reset is completed. The indicator lights at the FBIS and MBIS repeats the status of the FBOS and MBOS, or the OBS-FB and OBS-MB switchlights.

Panels 22C, 22F and 41B

PANEL TITLE

SIMULATOR CONTROL

NOMENCLATURE

RUN

COLOR

White

TYPE

Switchlight (1)

FUNCTION

This switchlight causes the simulator to commence operation from the point at which it was frozen.

Panels 4C, 4F, 22C, 22F and 41B

PANEL TITLE

SIMULATOR CONTROL (FBOS, MBOS and OBS-MB) SIMULATOR CONTROL STATUS (FBIS and MBIS)

NOMENCLATURE

RESET IN PROG.

COLOR

White

TYPE

Indicator Light (1)

FUNCTION

This indicator light illuminates while the simulator is in the process of resetting. Reset for initial conditions or playback is initiated via the CRT and keyboard. When the light is extinguished, the simulator is ready to run again.

COMMENTS -

LOCYTION

Panels 4C, 4F, 22C and 22F

PANEL TITLE

MAJOR EQUIP STATUS

NOMENCLATURE

VIS AVAILABLE

COLOR

White

TYPE

Indicator Light (1)

FUNCTION

This indicator light is illuminated when the visual system is on and indicates that the visual system is ready to operate.

LOCALION

Panels 4F and 22F

PANEL TITLE

MAJOR EQUIP STATUS

NOMENCLATURE

MOTION AVAIL

COLOR

White

TYPE

Indicator Light (1)

FUNCTION

When illuminated, this light indicates that the motion system is ready for operation.

Panels 4C, 4F, 22C and 22F

PANEL TITLE

MAJOR EQUIP STATUS

NOMENCLATURE

LINKAGE

: COLOR

White

TYPE

Indicator Light (1)

FUNCTION

When illuminated, this indicates that the computer linkage is ready for operation.

Panels 4C, 4F, 22C and 22F

PANEL TITLE

MAJOR EQUIP STATUS

NOMENCLATURE

SIM POWER ON

COLOR

White

TYPE

Indicator Light (1)

FUNCTION

This light illuminates when simulator power has been turned on at the main power cabinet.

Panels 3C, 3F, 12C, 12F, 22C, 22F, 31B and 41B

PANEL TITLE

MASTER POWER CONTROL

NOMENCLATURE

EMER STOP

COLOR

Red

TYPE

Switchlight (1)

FUNCTION

Activation of this switchlight will turn off simulator power.

COMMENTS

Barriers and a clear, spring-loaded, plastic cover will be provided to protect this control from inadvertent activation.

TOCATION

Panels 4A, 4D, 11A, 22A, 22D and 23A

PANEL TITLE

VISUAL SYSTEM MONITOR

NOMENCLATURE

SCENE SELECT -

LEFT/CTR/RIGHT

COLOR

Matte Black with White Pointer

TYPE

3 Position Rotary Control Knob (1)

FUNCTION

This selector switch permits the instructor and operator to display the left, center or right visual system display from the overall window group selected (group selection via CRT and keyboard.)

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14.1

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100 Form 1870 (Mar 76)

NASA-ISC

180 Form 1570 (Mar 16)

120 Februard Regulation

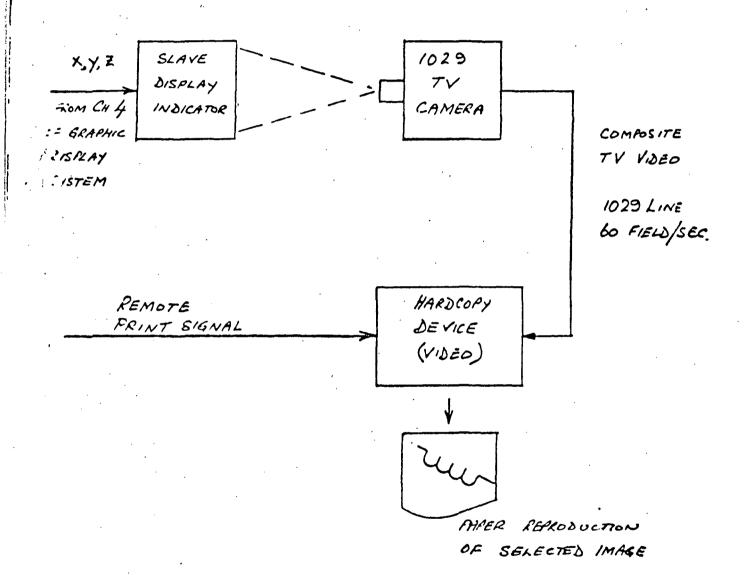
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R. L. MYERS	JSC	4/21/76	N22-004P		
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375 Fg. (1670 (Mar 76) | 10

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330 7cm 1570 (Mar 77)

HI- RESOLUTIONS HARD COPY



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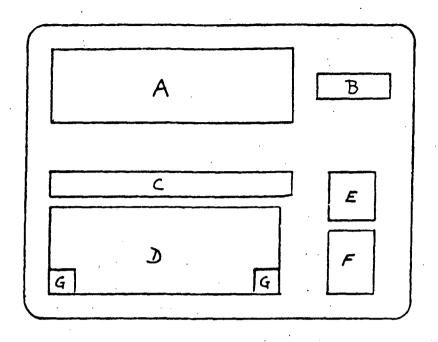
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COLOR ALPHA-NUMERIC DISPLAY SYSTEM COMPONENT DESCRIPTION



KEYBOARD ARRANGEMENT

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B - DISPLAY CHANNEL SELECT

C - CONTROL KEYS

D - CHARACTER KEYS

E - CURSOR DIRECTION CONTROL

F - NUMERIC KEY PAD

G - SHIFT KEYS

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JSC Form 1576 (Mar 78)

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4/22/16

180 Form 1670 (Mar 76)

FORWARD CREW STATION

PRELIMINARY DESIGN REVIEW MINUTES

TOM GEREK SECTION CHIEF

APPROVAL

CLIPF MIRE WORK PACKAGE MANAGER

C/S PDR-

Attendees

C. Mire
A. Ulangca

T. Gerek
K. Hickling

R. Meyers

Bruce Stark Charles Olasky Bert Gifford John Donnellon

Tom Gerek handed out Attachment 1 - updated forward panel configuration and Attachment 2 - updated forward component identification to reflect Revision C of panel layouts received at Rockwell 4/6 & 7. PDR for the Aft Station of FBCS is tenatively scheduled for June 11, 1976.

SPD stated that the following:

- 1) Forward structure
- 2) Overhead structure
- 3) Eyebrow structure

Designs have changed such that the MBCS structures require redesign - the forward structure can be reworked - However items 2 and 3 can not be reworked and require refabrication.

4) Most Flags on MBCS are not reusable - 3 position presently vs 2 positions on OAS.

SPD presented RID's S20-001P, 002P, 003P, 004P to NASA - (Attachment 7, 8, 9, 10).

SPD stated that the SMS instruments would

- 1) Be provided with Mil Spec. lighting.
- 2) Not have shatter shields

Discussion on the Rotational Hand Controller mounting structure led to the conclusion that SPD presently had adequate data in this area (OV101 data).

SPD stated that the Rudder Pedals would be the same as 101.

SPD stated that the Speed Brake/Thrust Controller for SMS would be same as OAS (101).

SPD presented a layout of the FBCS Crew Station/Platform. SPD stated that a 16 ft. corridor could be allowed for insertion of a mid deck structure by NASA. The height of the complex, including visual estimate, comes within 3 feet of the ceiling.

Action SPD - To firm up the estimate for the Aft Visual Structure size by July 1, 1976.

During discussion on entrance methods into the C/S SPD stated that if the mid deck is installed, the top of the mid deck mockup ladder would not reach the floor of the flight deck C/S due to platform floor thickness. The mid deck ladder would need to be made longer (taller) than normal. Discussion ensued on number of ladders providing entrance to the Crew Station - NASA wrote RID N20-001P (Attachment 5) to request 2 ladders.

The CEI spec was reviewed - NASA requested

- 1) A statement that the FBCS mod kit would be added at a later date.
- 2) Annotate the appendix as to FBCS or MBCS.
- 3) Add statements as to differences between FBCS, FBCS mod kit or MBCS mod kit.
- 4) Add statements as to FBCS structure.

NASA wrote RID N20-002P (Attachment 6) on CEI spec for C/S In general NASA requested more detail in the CEI specs. Discussion ensued on the CEI format. This will be discussed during the program review. NASA is concerned that the CEI formats do not presently allow the individual CEI's to be combined into one total document.

Discussion ensued on the status of the GFE dates.

NASA requested SPD to provide on the form of Attachment 3 the following info for Panels, Assembly drawings, and Structure drawings. (Attachment 3 covers the forward station, only at this time).

- 1) Which items does the Rockwell schedule depict release dates for VO type drawings prior to the GFE data of 6/26.
- 2) Which items does the Rockwell schedule depict availability dates for VL type drawings prior to the GFE date of 6/26.
- 3) Which items does the Rockwell schedule depict VO or VL drawings subsequent to the GFE date of 6/26.

It was noted that for all items which fall into category 3, NASA and SPD would make assumptions prior to 6/26 to allow SPD effort to proceed. A working meeting with NASA will be held during the week of June 21, 1976 to finalize these assumptions.

NASA requested comparable information on Spec Control drawings except the GFE data delivery date is 5/26. A working meeting with NASA will be held on or before 5/26, at Houston, to finalize assumptions in this area.

This information is enclosed as Attachment 13.

NASA wrote RID on Panel #019 Definition. (Attachment 14).

SPD notified NASA that the HSI Faceplate Bezel has changeda RID has been submitted to NASA on OAS and has not been dispositioned.

SPD submitted RID's on HSI configuration changes and shatter shields (Attachment 11 & 12).

SPD stated that a component listing (partial) was received from Rockwell 4/19/76 and will be compared with the PDR documentation. The partial Rockwell list will be used to update the documentation in areas where applicable, SPD may still have quantity descreptances due to drawing layout interpretion and the partial component listing being incomplete. NASA stated that Attachment 3 should be filled out by SPD to indicate on a panel or a component basis whether SPD plans on utilizing released drawings or specs, layout drawings, preliminary specs or undimensional layouts. (Based on Rockwell schedule received 4/6/76.)

Attachment 4 was presented by A. Ulangca.

SPD stated that the panel fastener would not be real-world due to cost considerations. TRIDAIR used in vehicle - SPD suggests use of captive screws. (Ref. OAS.)

Discussion on secondary structure led to NASA giving SPD permission to assume the glareshield will be same as 101. Discussion on the GFE seats led to NASA giving SPD permission to assume the GFE F12 seats would mount and interface with the SPD structure the same as OAS seats.

SPD Action - Abstract from Attachment 3 the areas where there is indication that NO VO's or VL's are planned to be available prior to 6/26/76 and concentrate on working with Rockwell to obtain data or pieces of data which will help support SPD design or assumptions needed to enable Singer to "move-out" on 6/26/76.

Agranication

The following forward panels were changed by Revision C of VL70-730102.

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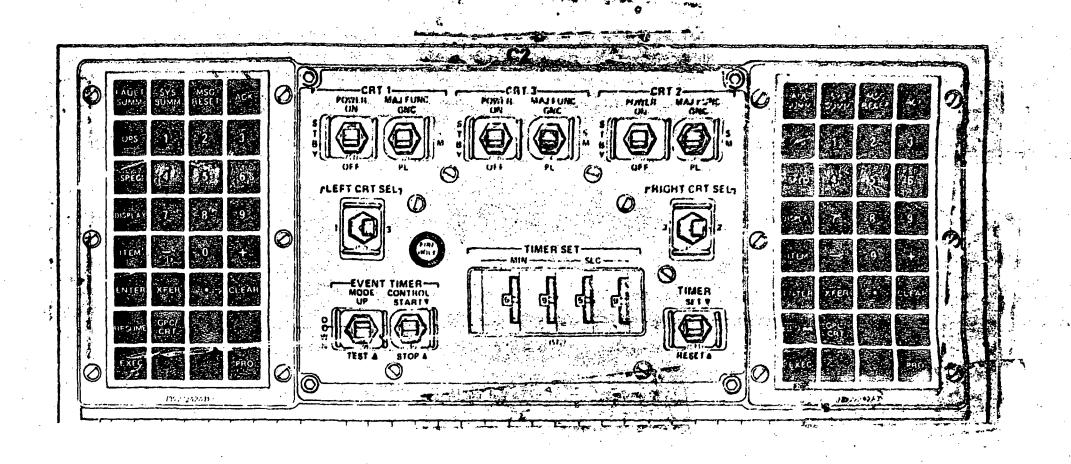
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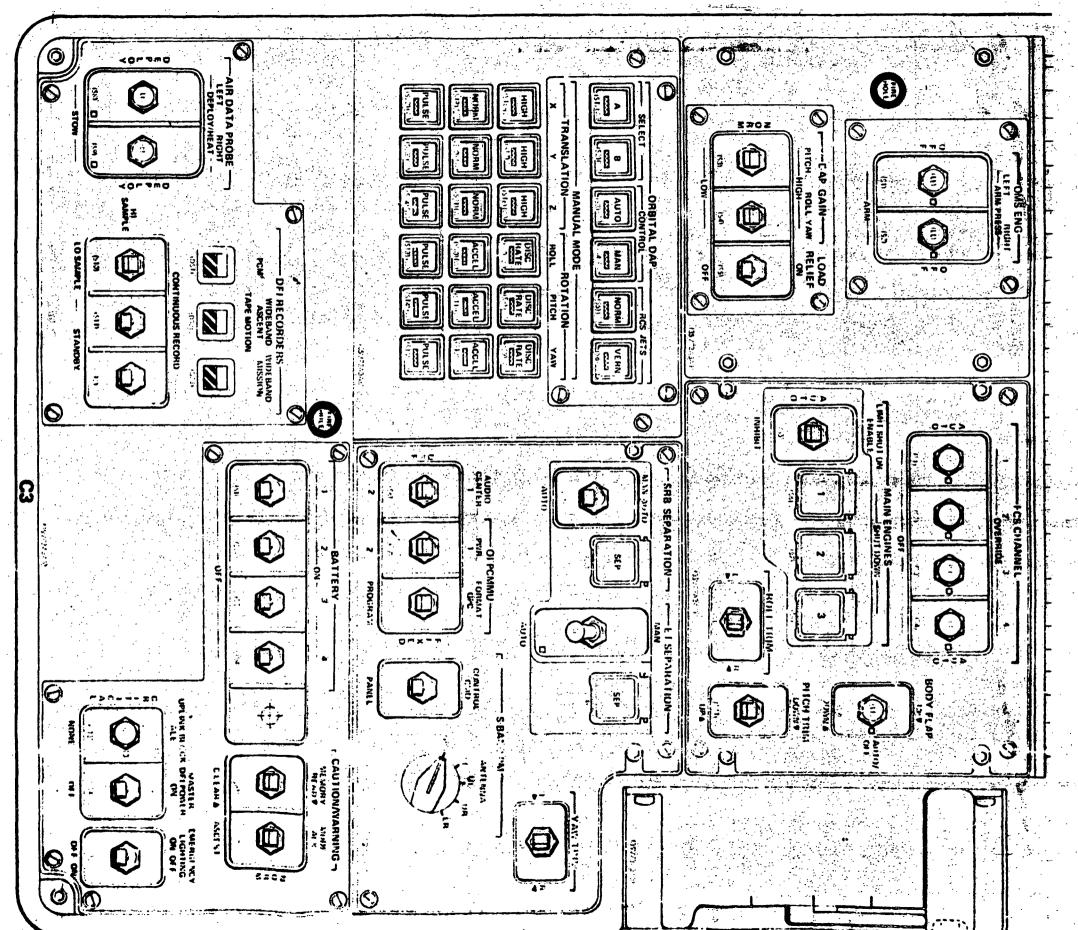
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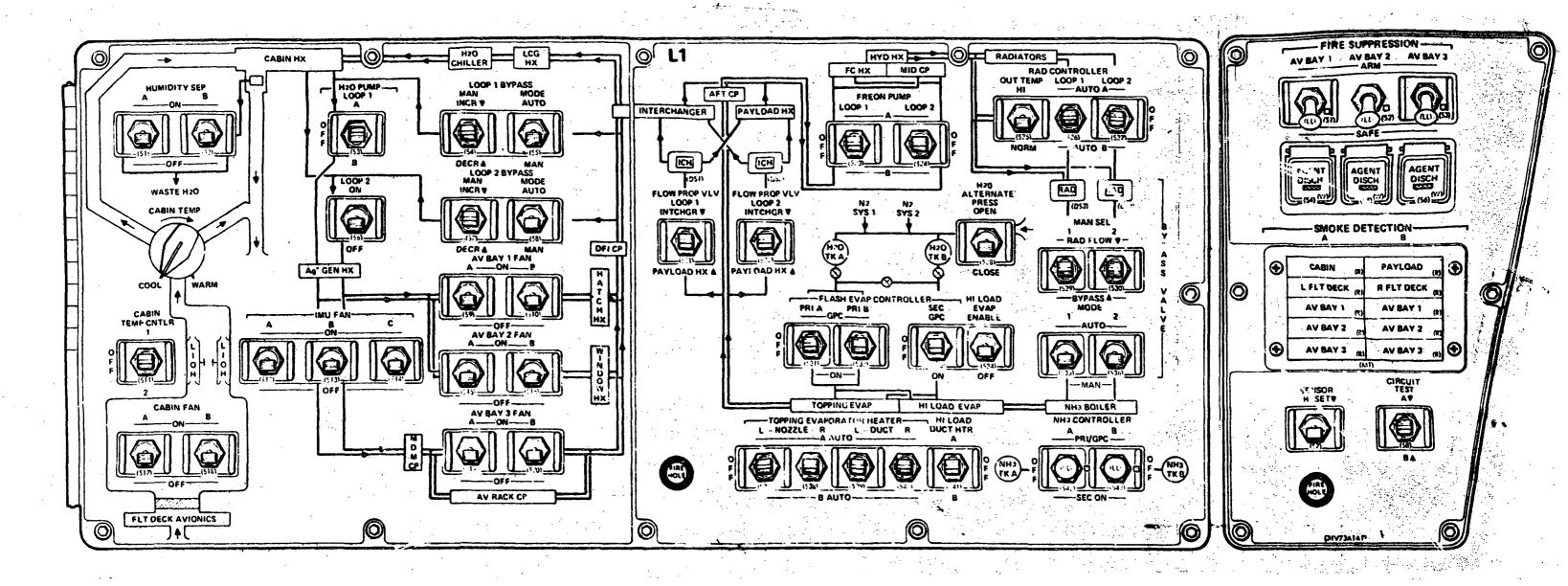
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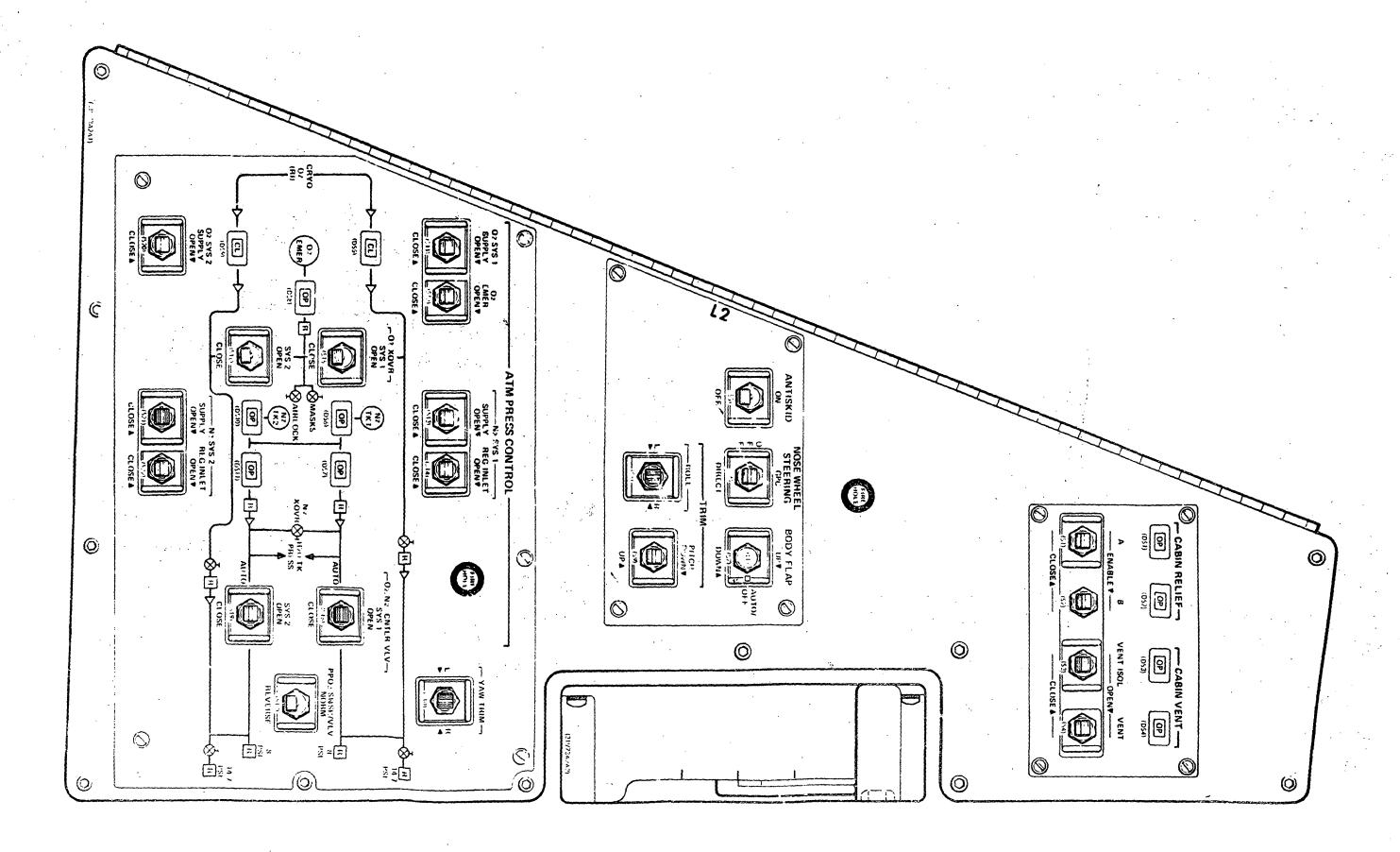


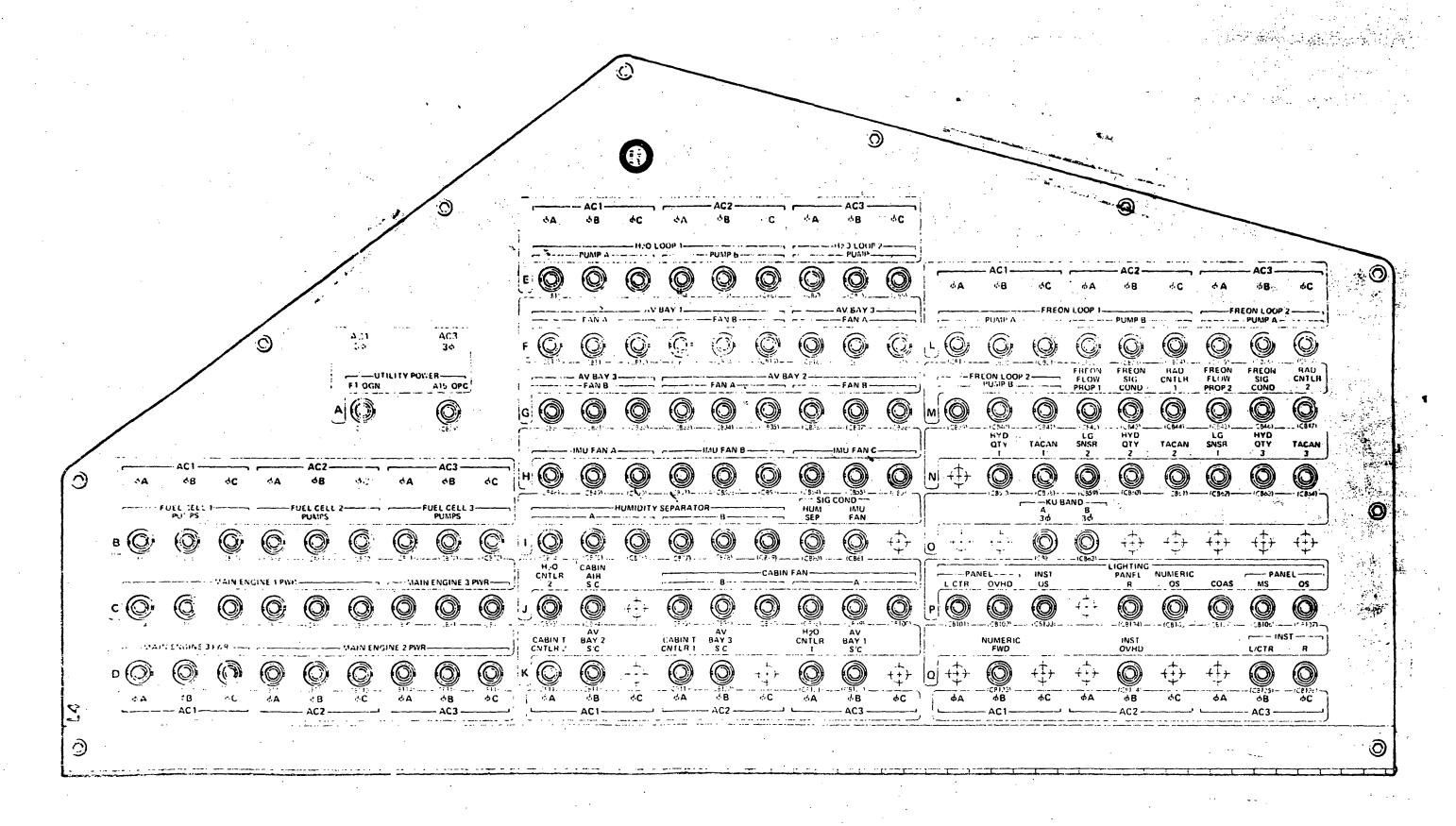
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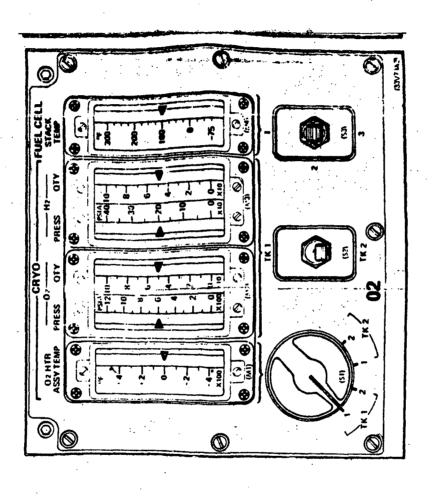


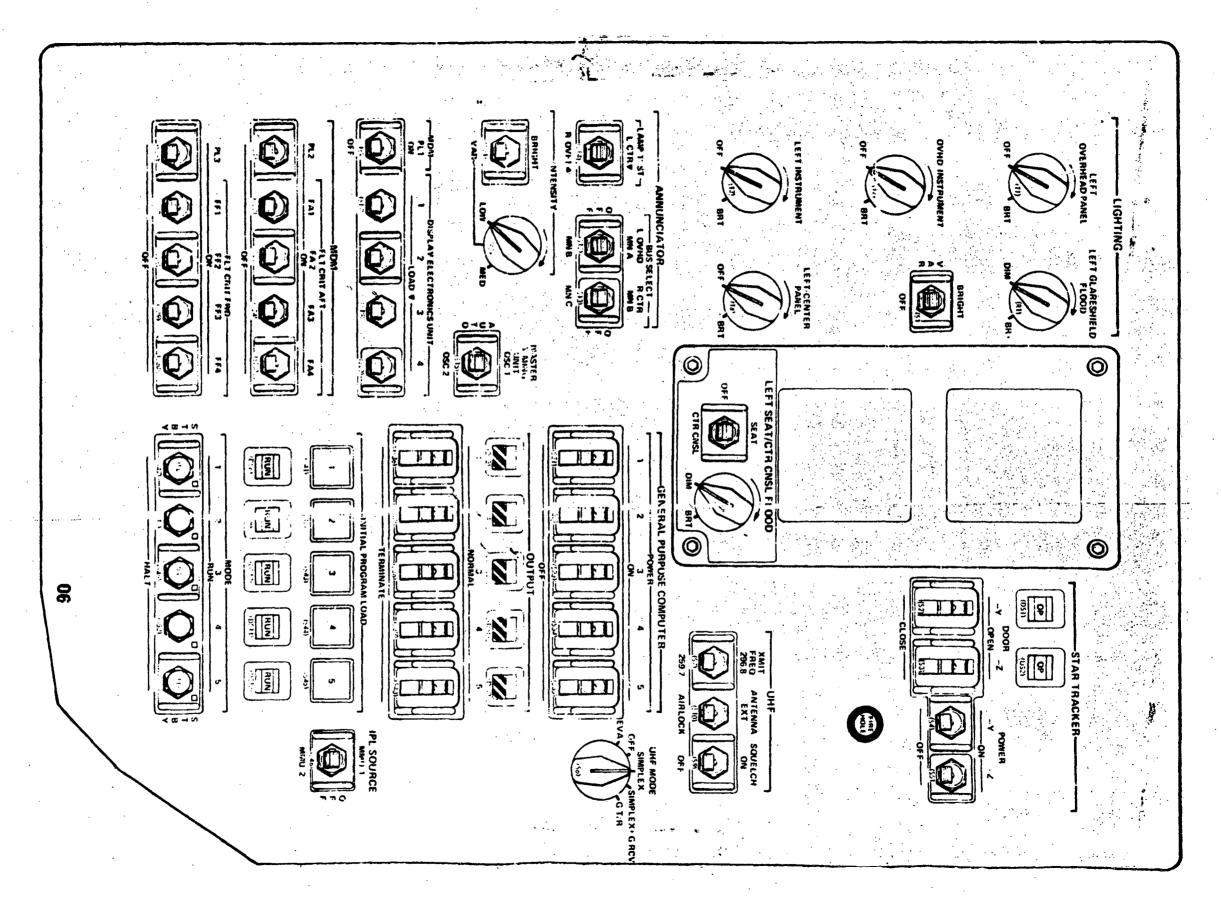
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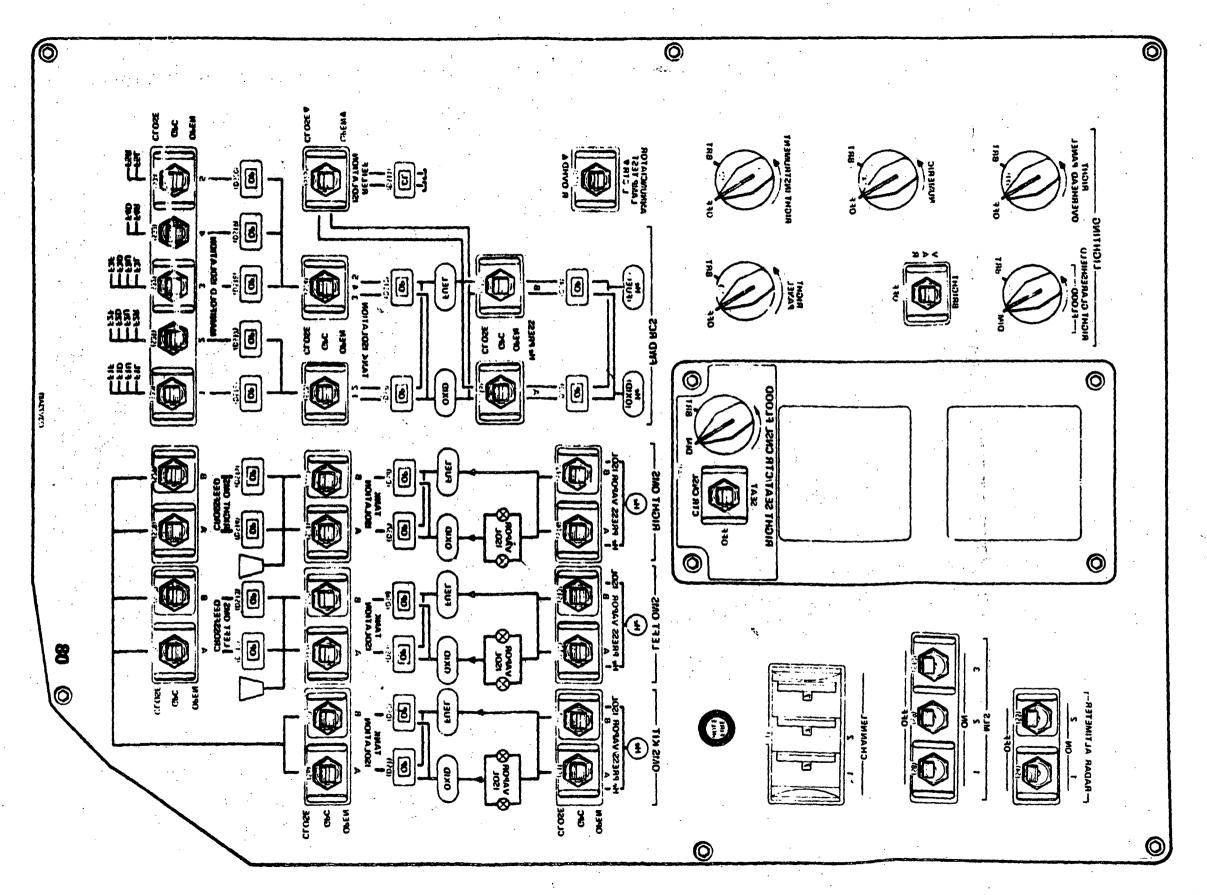


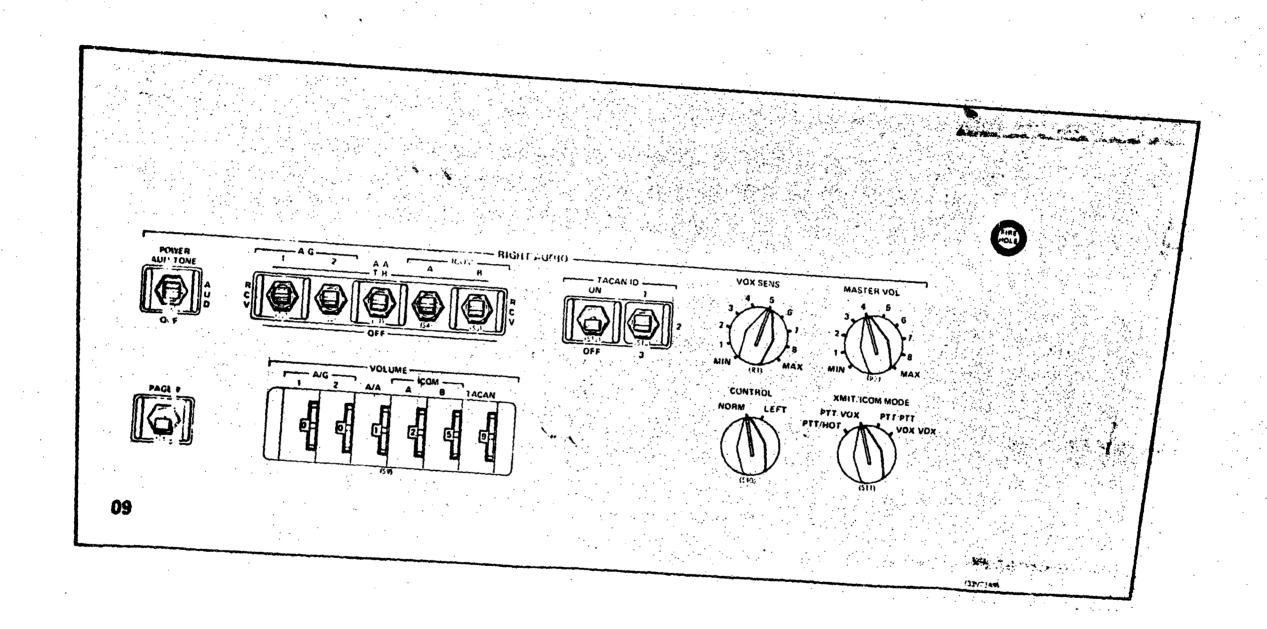


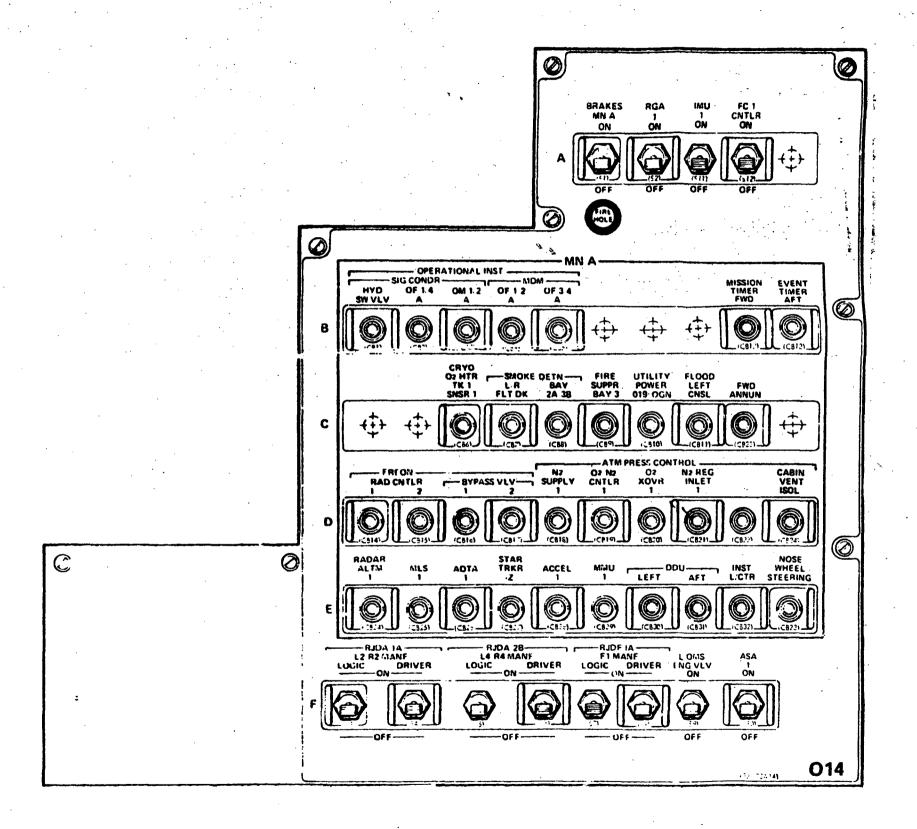


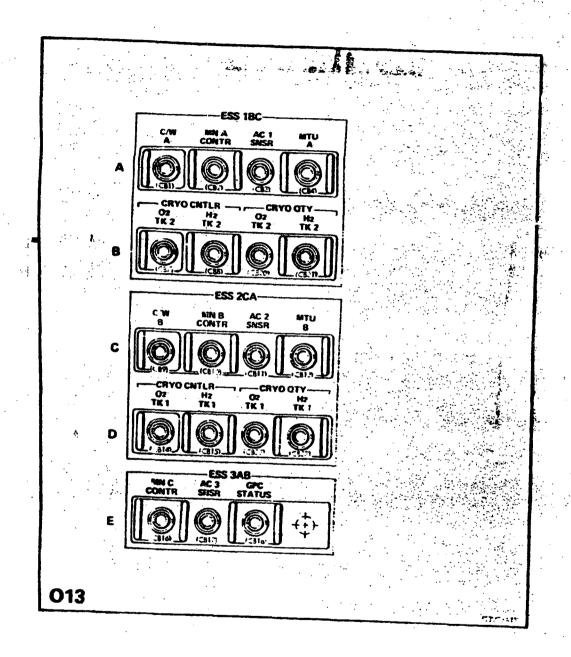


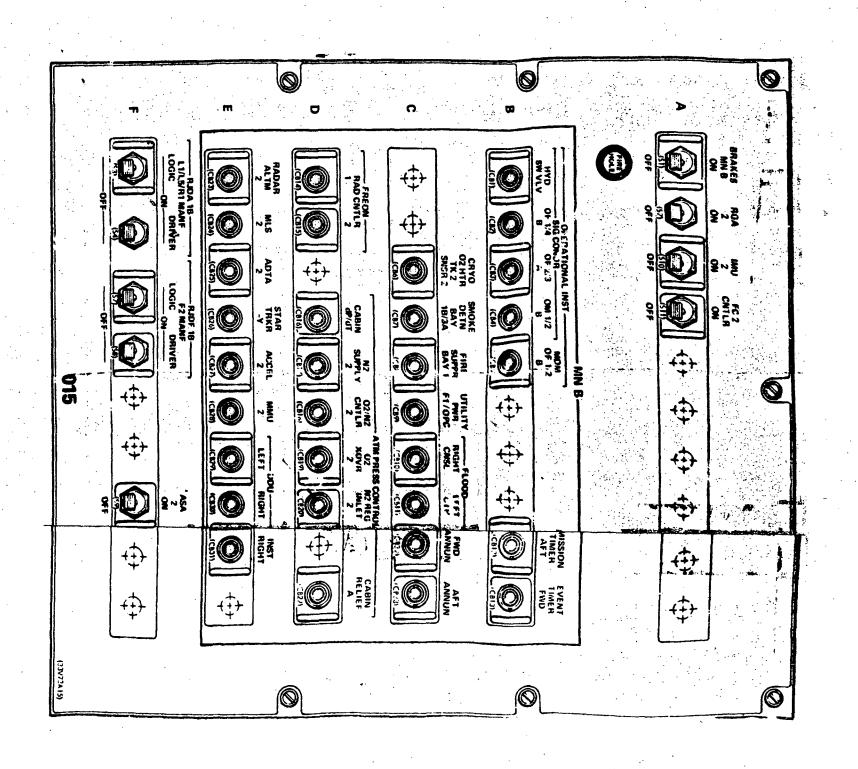


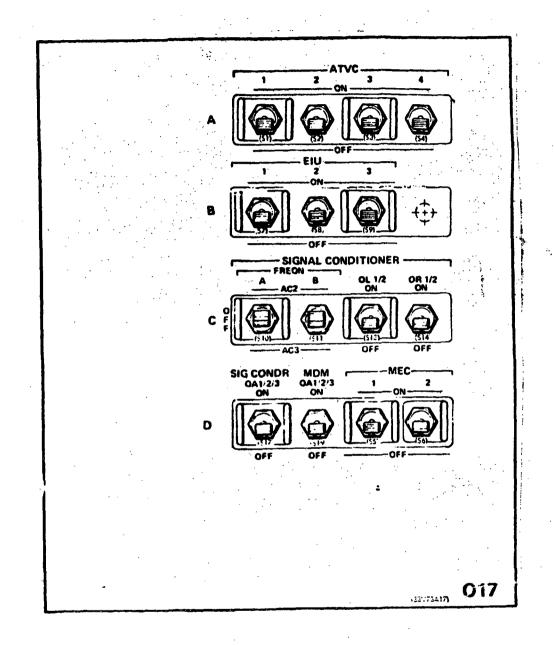


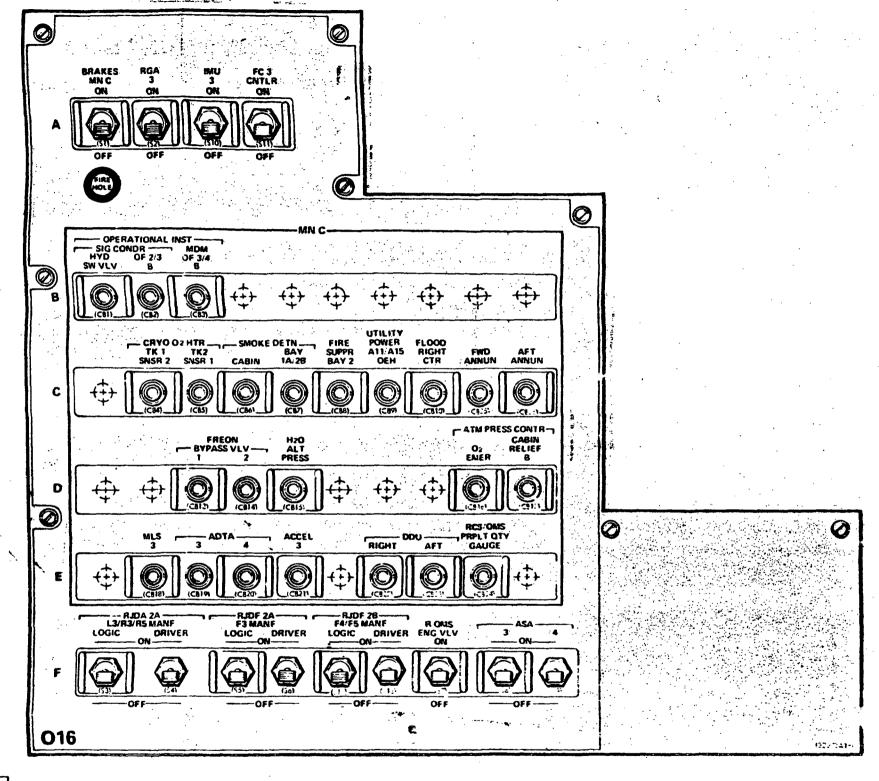


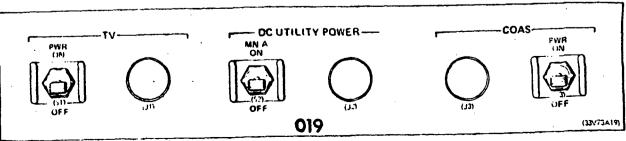




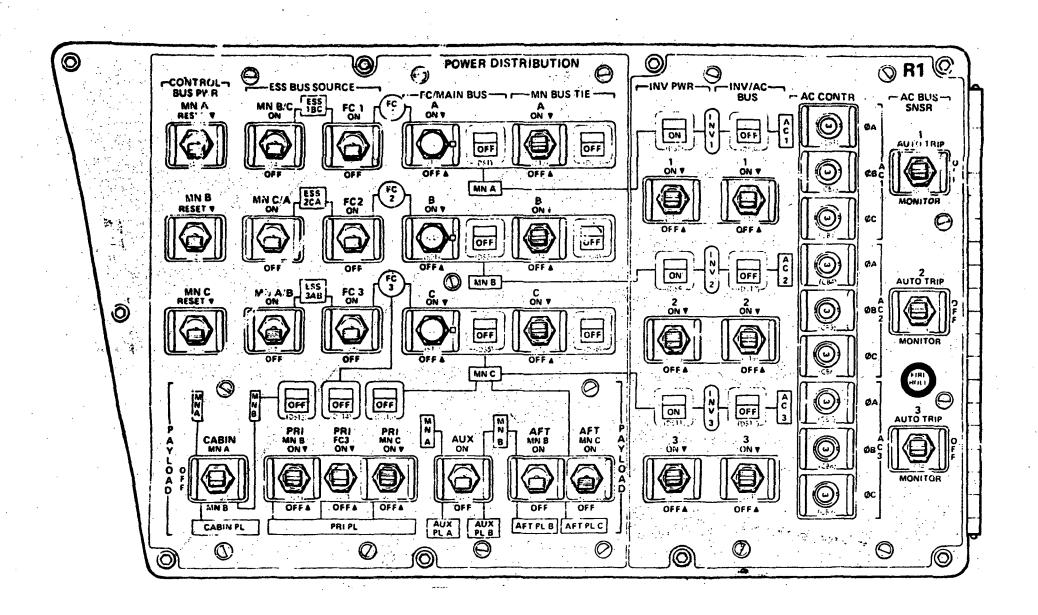


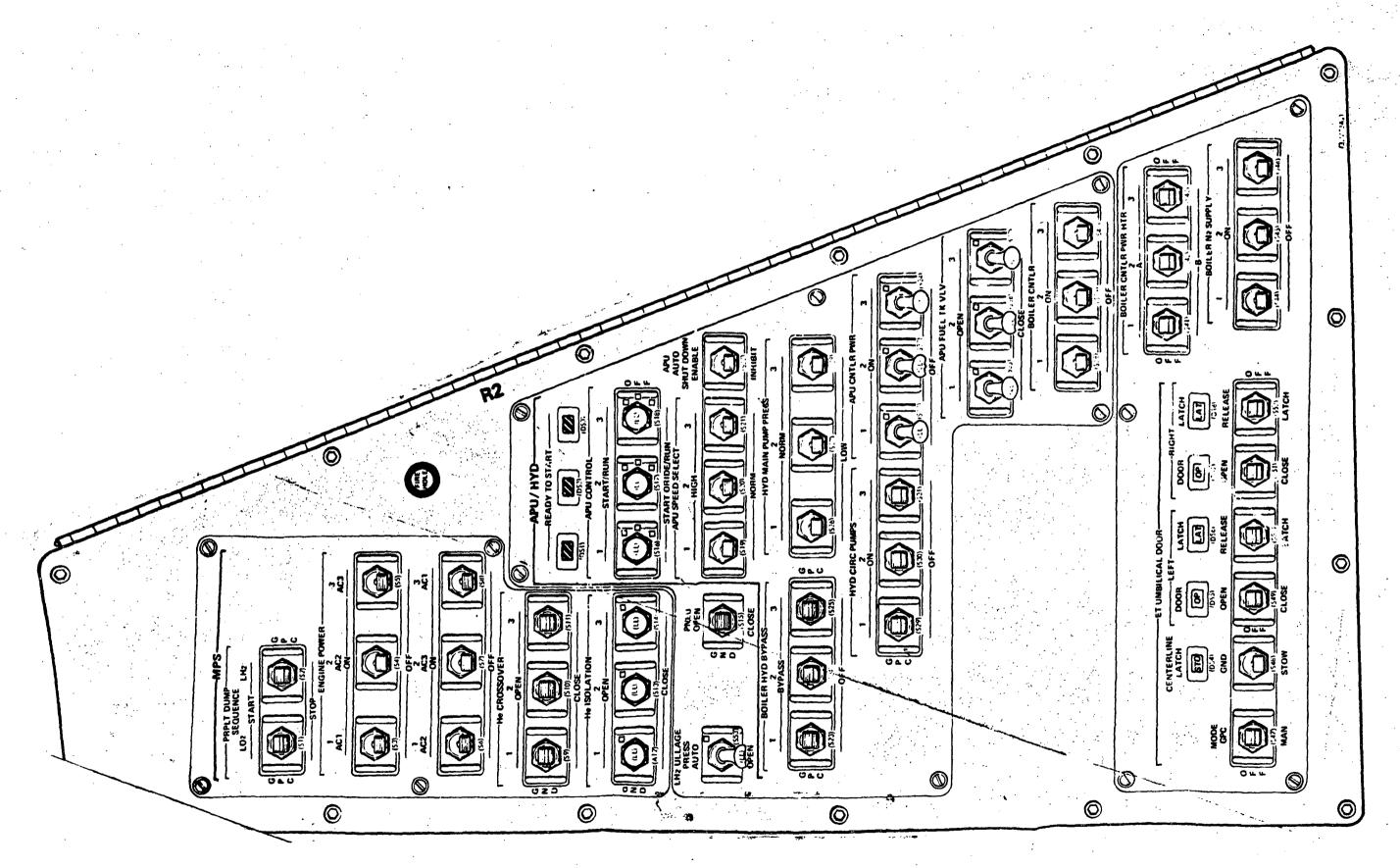


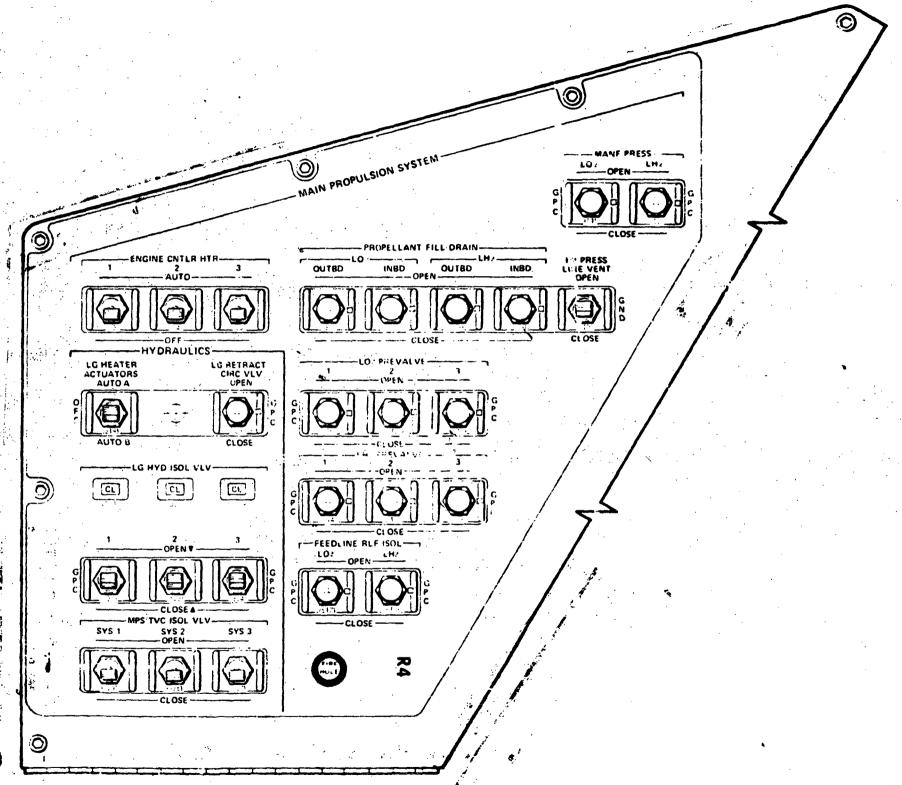




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PDR Ground Rules SMS WP #20 (Crew Station, C&D)

- 1. <u>Design</u>, <u>build</u>, and <u>assemble</u> all required hardware which has a 50% + confidence factor of being correct.
- 2. Stagger schedule as much as possible to take advantage of obtaining data in lieu of having to use assumptions but such that Singer does not slip end dates. As required, make options based on assumptions which will enable Singer to perform needed work on a workable schedule to meet their end item delivery within cost and schedule.
- 3. Procure all needed vendor parts A/R for both FBCS and MBCS and assemble them per ground rule #1 above.
- 4. Any exceptions to the above three ground rules are to be flagged, with rationale, to R. D. McCafferty for his understanding and possible redirection.
- 5. Document through minutes, as a minimum, general actions taken!

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THE SINGER COMPANY
SIMULATION PRODUCTS DIVISION
BINGHAMTON, NEW YORK

CREW STATION

CONTROLS AND DISPLAYS

REVISIONS	PREPARED BY (TYPE OR PRINT)	DATE	PREPARED BY (SIGNATURE)	DATE	CHECKED BY	DATE	APPPOVED	DATE.
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THE SINGER COMPANY SIMULATION PRODUCTS DIVISION

PAGE NO.

REV.

BINGHAMTON, NEW YORK

REP. NO.

CREW STATION CONTROLS AND DISPLAYS

Each crew station control and display will be duplicated in appearance, location, feel, fit, action and reaction to the high degree required for crew training.

All cockpit lighting controls on simulated panels will be operative. Lighting will be variable where required, through operation of the dimming controls. Panels will be lit as in the spacecraft, and integral lighting for instruments will be provided. Power logic will be incorporated in these circuits.

Most of the crew station controls and displays will interface with the simulation computer complex through analog and digital Signal Conversion Equipment (SCE).

Discrete Functions

Discrete digital functions include such devices as switches, flag and lamp type indicators (event indicators and annunciators), circuit breakers, decimal readouts, keyboards, and other special devices such as the DEU or parallel to serial converters for special instruments.

Representative examples of discrete components and how they are wired to the SCE are illustrated.

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REV.

THE SINGER COMPANY SIMULATION PRODUCTS DIVISION

PAGE NO.

BINGHAMTON', NEW YORK

REP. NO.

The basic design philosophy used on the OAS shall also apply to the SMS. All switches of 3 positions or less shall have N-1 DI's assigned (n=number of positions). All switches 4 positions or more shall have a DI for each position. The position that will not be assigned a DI shall be (a) the "OFF" position, or (b) the switch position shown on the layout drawing if it is a three position switch, or if there is no "OFF" position.

The lamp test function shall be provided as in the space-craft, and, as in OAS, all the LO-controlled lamps shall be diode isolated. This will prevent false indications in the SCE self-test when lamp test is actuated.

Digital I/O are DI's, DO's, and LO's.

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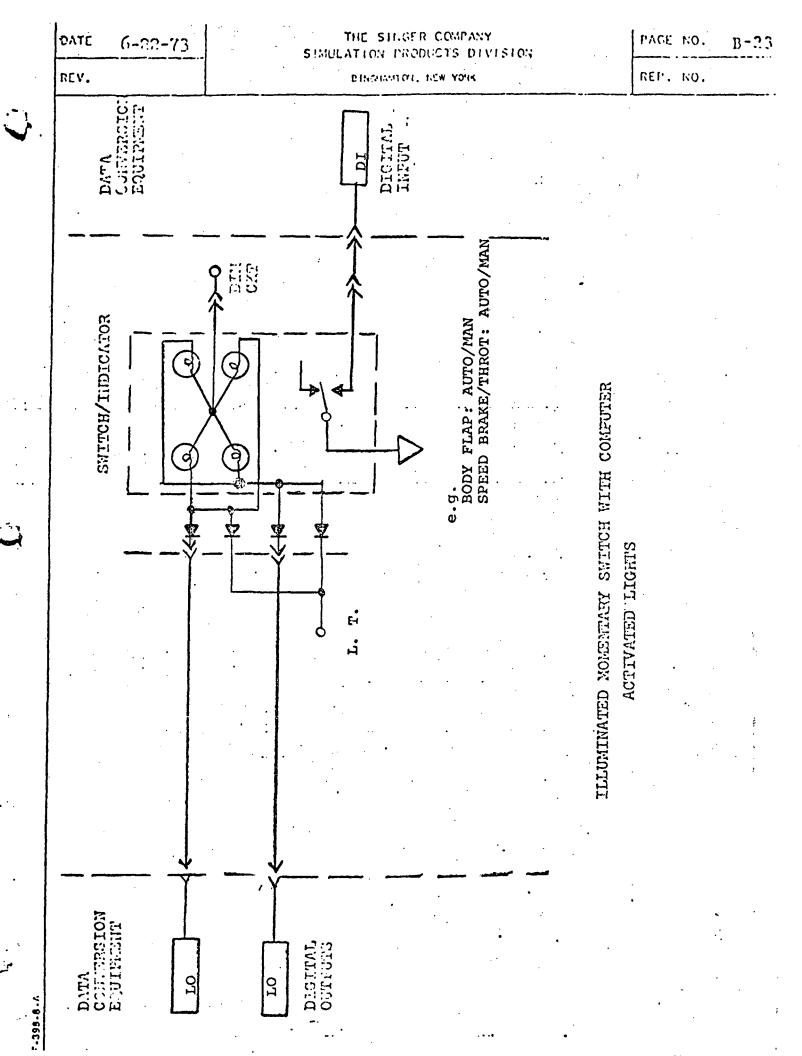
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DATE 6-22-73 THE STUGER COMPANY PAGE NO.B-19 SIMULATION PRODUCTS DIVISION . REV. REP. NO. BINGINGTON, NEW YORK CAUTION & WARNING (ACOMPUTER STATUS (25) FIRE WARNING (10)

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THE SINGER COMPANY SIMULATION PRODUCTS DIVISION

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REP. NO.

Analog Functions

Analog functions include potentiometers and other transducers for control or measurement, and D'Arsonval meter movement and DC and AC servomechanisms for display and positioning.

The RHC, THC, and SBTC will input their position to the computer through an analog-to-digital device in the SCE called an AI.

Meter movement instruments will be driven directly from computer programs through digital-to-analog converters (AO's). Examples shown are the round and vertical meters.

Other cockpit indicators are driven by one or a combination of the following drive systems:

- (a) DC Servo Type 1
- (b) DC Servo Type 2
- (c) DC Servo Dual Speed
- (d) DC Synchro
- (e) AC Synchro (ESRD)

A <u>DC Servo movement</u> is one which contains an operational amplifier with sufficient high gain that sums a drive signal and a follow-up signal. This amplifier then positions a motor as a function of the error signal produced. The pointer is geared to the motor and to the precision follow-up potentiometer.

THE SINGER COMPANY PAGE NO.

SIMULATION PRODUCTS DIVISION

REV. BINGHAMTON, NEW YORK REP. NO.

When the requirement is for a multiple-turn device, there is need for greater accuracy plus the ability to keep track of the number of turns made. This is accomplished by having both coarse and fine signals. The coarse signal is a single AO channel. The fine signals consist of two phase related waveforms. In the instruments for OAS and SMS these are true sine and cosine.

A DC Synchro movement is one in which the indicator pointer is positioned by the DC produced field between two coils. One field is produced from a signal containing the sine of the desired pointer angle and the second field is produced from a signal containing the cosine of the desired pointer angle. The pointer itself is mounted on a rotor.

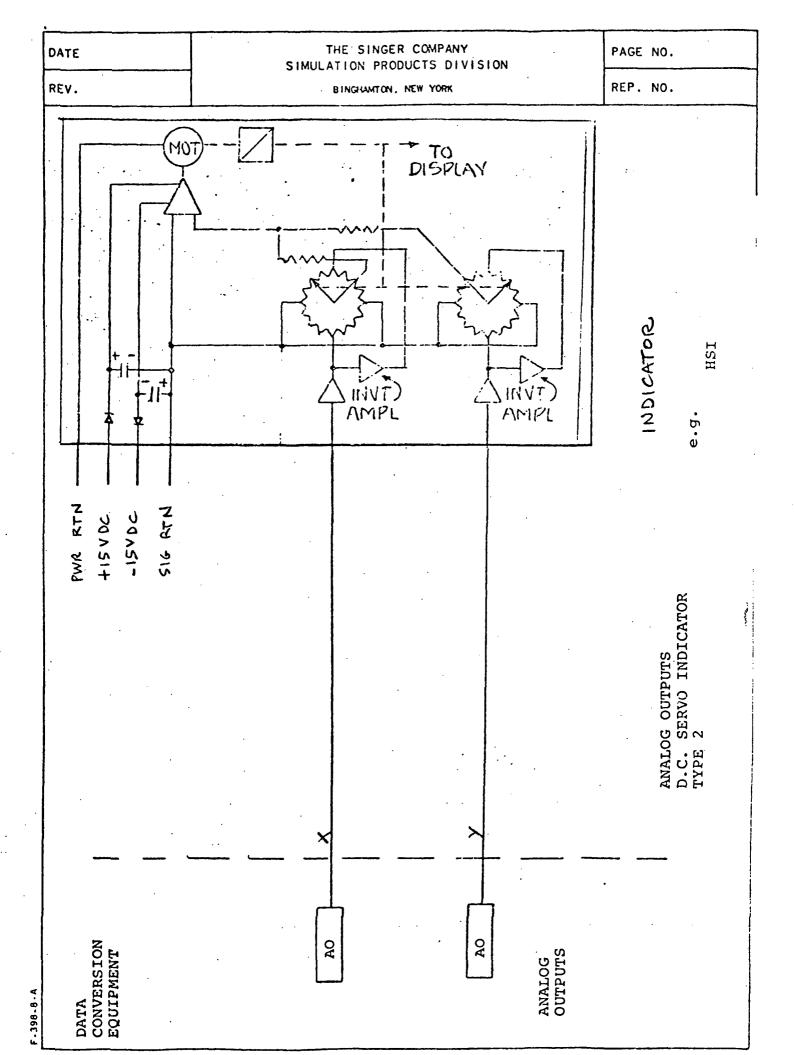
An <u>AC Synchro movement</u> is simply a classical synchro receiver, connected to an indicator pointer. Its position is determined by the phase relation and voltage on each of three coils. The rotor is positioned in the field of these coils. This type, so as to be driven by the DC outputs from the SCE, require ESRD's which convert two phase-related DC signals into the three required voltages.

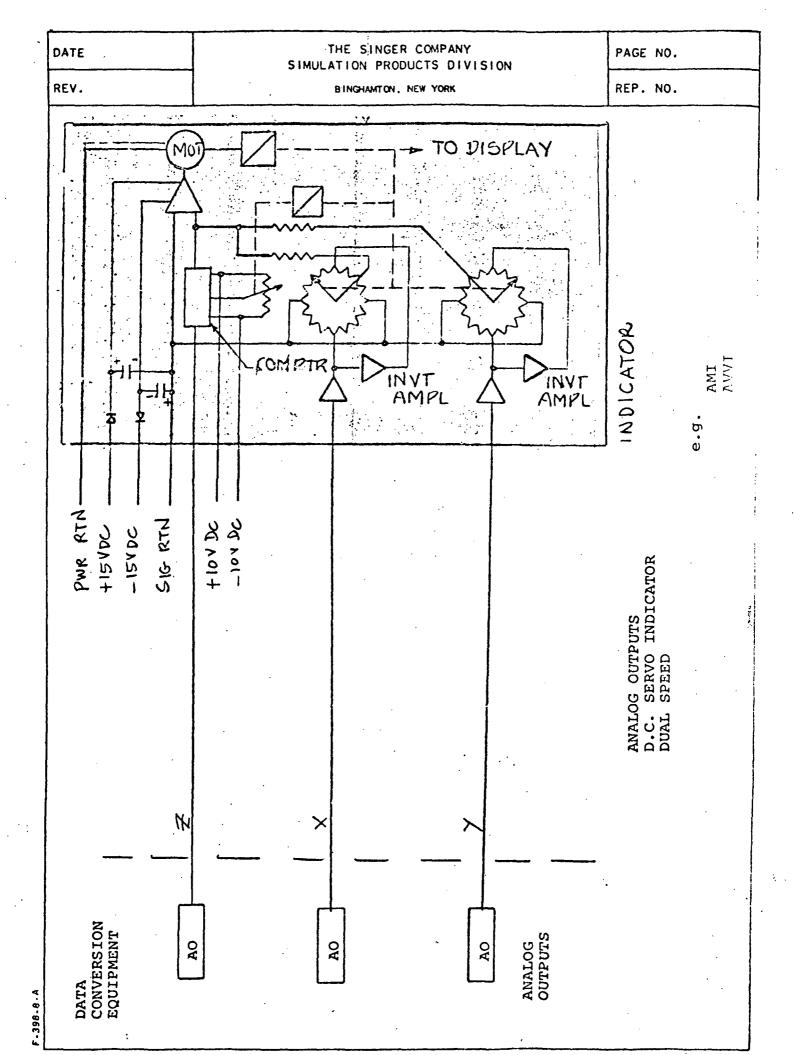
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		ANALOG INPUT POTENTIOMETER CONTROL	
 POTENTIOMETER	+V REF. -V REF. SBTC RUDDER PEDALS WHEEL BRAKES		

DATE THE SINGER COMPANY PAGE NO. SIMULATION PRODUCTS DIVISION REP. NO. REV. BINGHAMTON, NEW YORK RES PANEL METER MOVEMENT ROUND METERS: AC VOLTS DC VOLTS DC AMPS \{\sqrt{\sq}\}}}\sqrt{\sq}}\sqrt{\sq}}}}}}}}}}}\eqien\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sq}}}}}}}}\eqien\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sq}}}}}\eqien\sqrt{\sq}\sq\sign{\sqrt{\sq}\eqs}}}\eqien\sqrt{\sq}}\eqien\sqrt{\sq}\eq\sign}\sqrt{ Rl D'ARSONVAL METER INSTRUMENT **R**2 DATA CONVERSION EQUIPMENT ANALOG OUTPUT AO

DATE THE SINGER COMPANY PAGE NO. SIMULATION PRODUCTS DIVISION REV. REP. NO. BINGHAUTON, NEW YORK LEFT HAND POINTER POINTER e.g. VERTICAL METERS SHUNT AS REQUIRED TYP INDICATOR LIGHTING S C A D J LH SC Ø ADJ -10 V DC-100 8 と ANALOG OUTPUTS METER DRIVE DATA CONVERSION EQUIPMENT AO ANALOG OUTPUTS

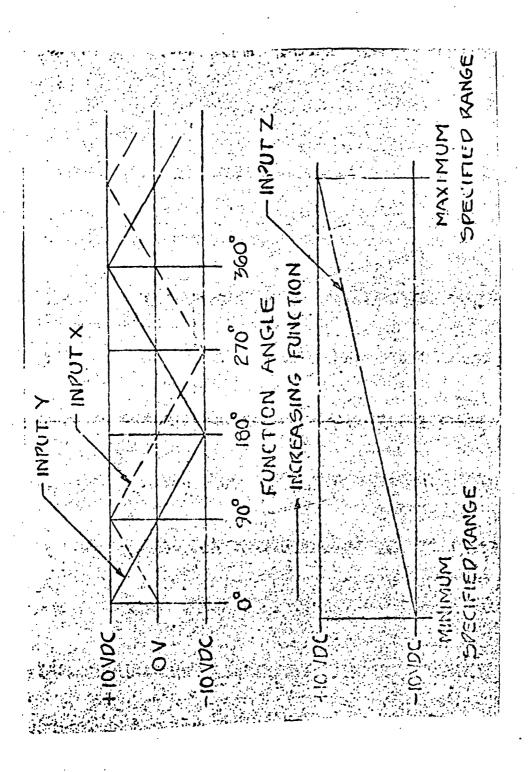
THE SINGER COMPANY PAGE NO. DATE SIMULATION PRODUCTS DIVISION REP. NO. REV. BINGHAMTON, NEW YORK TO DISPLAY TAPE METERS ADJ INDICATOR IďS e g ANALOG OUTPUT SERVO INSTRUMENT OR DEVICE +15 V DC-PWR RTN--15 V DC--10V DC SIG RTN TYPE 1 DATA CONVERSION EQUIPMENT ANALOG F-398-8.A





THE SINGER COMPANY
SIMULATION PRODUCTS DIVISION

REV. BINGHAMTON, NEW YORK REP. NO.



COARSE (Z) AND -01 FINE (X,Y) SIGNAL INPUTS -02 HAS TRUE SINE & COSINE FOR THE FINE SIGNAL INPUTS

THE SINGER COMPANY, PAGE NO. DATE SIMULATION PRODUCTS DIVISION REP. NO. REV. BINGHAMTON, NEW YORK EDDIODES SHALL BE IN5246(16V OR EQUIVALENT * INPUT FILTER LIGHTING, WHEN SPECIFIED POINTER CHASSIS GND ACTUATOR ACCELEROMETER 16 ξ B U ۵ 0 T M 28 VDC RIN SVRTW. PWR GND +15VDC. -15V DC -2anse S16 6ND ANALOG OUTPUTS SYNCHRO-REPEATER TNDICATOR ပ 'n CONVERSION TIOVAC 110 V DC DATA AO Cos AO

THE SINGER COMPANSIMULATION PRODUCTS DISSION PAGE NO. DATE REP. NO. REV. BINGHAMTON, NEW YORK 400 HZ REF SYNCHRO RX ANALOG OUTPUT SYNCHRO RX. ESRD CONVERSION ANALOG DATA F-398-8-A

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1. INITIATOR ORGANIZATION DATE NO.	
B. M. GIFFORD NASA 4/20/76 N20-001F	>
SECOND FBCS ENTRANCE LADDER	
2. DESCRIPTION OF PRUBLEMI	
PRESENT DESIGN INCLUDES TWO HATCHES WITH ONE LADDER SAFETY HAZARD FOR EMERGENCY EGRESS.	
3. RECOMMENDATION:	
ADD SECOND LADDER TO FIXED BASE HATCHES.	
4. IMPACT, IF RECOMMENDATION NOT IMPLEMENTED:	
SECONDARY ENTRANCE/EXIT WILL BE THRU HATCH TWELVE FEET ABOVE FLOOR.	
ADOVE TEOR.	
5. CONCURRENCE WES MANAGER (1)	
WAS MANAGER - Was C. Mire TEAM LEADER 35 h 5-18 6-61	
6. DISPOSITION	
Approved Disapproved Withdrawn Tech. Direction Contractor's Impact Statement Req.	
COMMENTS	
APPROVAL	i
TECHNICAVIMANICE. L. CLURKY 4/22/26	
7. CONTRACTOR'S (MPACT STATEMENT:	
COST IMPACT UNDER \$2,000 - NO SCHEDULE IMPACT.	
	-
LeBran 4/21/26	
8. SCP ACTION:	
57	
APPROVAL .	
SCP CHAIRMAN DATE	

SMS	PROGRAM DIREC	7 T 1 W C	
, Drig	-		FB & MB
1. INITIATOR	ORGANIZATION	DATE	NO.
T. GEREK	SPD	4/15/76	S20-101P
SECTION CHIEF	·		
2. DESCRIPTION OF PROBLEM			
THE TYPE OF EVENT INDICAT FROM ALL 2 STATE TO MOSTI INCREASED SCE REQUIREMENT EXISTING OAS EVENT INDICA	LY 3 STATE TYPE FS. ALSO, THE	S RESULTING I MBCS CANNOT U	N AN
3. RECOMMENDATION.		<u> </u>	
INCORPORATE THE 3 POSITIO	N EVENT INDICA	TOR.	
	144 and V and 01 and 1 and 1 and 1 and 1		
		•	
4. IMPACT, IF RECOMMENDATION NOT IMPLEMENT	ED,		
THE SMS AND 102 VEHICLE W	TII. NOT BE THE	SAME CONFIGI	₽₮₼₮₳₦
• • • • • • • • • • • • • • • • • • • •		Dining Cold 100	CALTON:
5. CONCURRENCE			
WBS MANAGER Cliff hu	TEAM LEADS	Br G	XX.X
6. DISPOSITION			31
Approved	Disapproved	Withd	
Tech. Direction	on Contractor	s Impact Statement Re	q.
COMMENTS			
ADADALI			· · · · · · · · · · · · · · · · · · ·
TECHNICAL MANAGER		DATE /20/2	
L. Olbriby		14/20/2	<u>'6</u>
7. CONTRACTOR'S PACT STATEMENT			
COST FOR EVENT INDICATORS INCREASED. THE FBCS WILL	ALSO HAVE SIMI	LAR COST INCR	EASE.
8. SCP ACTION.			
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_5R			
APPROVAL			
SCP CHAIRMAN ME ALL A		PATE 4/	22/76

SMS PR	OGRAM DIRECT	IVE FB &	MB
1. INITIATOR	ORGAN I ZATION	DATE	NO.
m CDDDV	SPD	4/15/76	S20- 002P
T. GEREK	SFD	4/13/70	520 0021
SECTION CHIEF			
Z. DESCRIPTION OF PROBLEM.			
REVISION C to VL70-730102 HAV DATA SUPPLIED FOR PDR DOCUMEN	VE CHANGED TH NTATION, CAUSE	HE FORWARD PA	NELS FROM
3. RECOMMENDATION:			
INCORPORATE THE CHANGES INTO	THE FORWARD	PANEL AT PDR	
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4. IMPACT, IF RECOMMENDATION NOT IMPLEMENTED:			
THE SMS WILL NOT BE IN CONFIC	GURATION WITH	WEHICLE 102	•
•			
5. CONCURRENCE			
	Yeys TEAM LEADER	BMGH	in X
6. DISPOSITION			
Approved Tech. Direction	Disapproved Contractor's 1	mpact Statement Req	
COMMENTS:			
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APPROVAL			
TECHNICAL MARIAGER		14/20/16	
7. CONTRACTOR' SIMPACT STATEMENT,	•		·
COST INCREASE AND INTERMEDIA'S AND MBCS.	TE SCHEDULE (CHANGES FOR B	OTH THE FBCS
7 Hank felt 4/10 & Diser	4/19 leBus	w 4/21/7	(
8. SCP ACTION:		•	
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5R	ı		•
APPROVAL			
SCP CHAIRMAN	· · · · · · · · · · · · · · · · · · ·	DATE	22/2
Melallus		4/2	22/16

·	SMS PROGRAM DI	RECTIVE	FB & MB
1. INITIATOR	ORGANIZATION	DATE	NO.
T. GEREK	SPD	4/15/76	S20-003P
TITLE			
SECTION CHIEF			i , , , ,
LAYOUT DATA RECEIVED EYEBROW, L&R CONSOLE CHANGING TO ACCEPT THE CMS ASSUMED THAT THES	AND CIRCUIT BRE	AKER STRUCTURE SPD-PROPOSED C O	ARE
• RECOMMENDATION :			
INCORPORATE THE CHANG THE SAME CONFIGURATIO	SES SO PANELS AN ON AS THE 102 VE	D STRUCTURES WI HICLE.	LL BE
. IMPACT, IF RECOMMENDATION NOT IMP	LEMENTED		
SMS PANELS WILL NOT M		NG OAS DESIGNED	STRUCTURE.
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CONCURRENCE WBS MANAGER	1.0 h -1/29/21 TEAM 1	EADER	(C.O.
	Mui 4/2976 TEAM 1	BW C	~\\\
. DISPOSITION			
Approved		oved With lor's impact Statement R	drawn
	<u> </u>	tor a impact statement a	ец. ————————————————————————————————————
COMMENTS			
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APPROVAL		T	
TECHNYCAL MANABER		DATE /20/	176
CONTRACTOR'S IMPACT STATEMENT. COST INCREASE AND INT	ERMEDIATE SCHED		
AND MBCS.			
1- Jun to KIH 4/10.	I Hise 4-19.	76 Chian	4/21/16
SCP ACTION:		•	
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APPROVAL		······································	

	SMS PROGRAM DIREC	TIVE	
1. INITIATOR	ORGANIZATION	DATE	NO.
T. GEREK	·		S20-006P
INSTRUMENT CONFIGU	RATION-SHATTER SHIP	ELDS	
INSTRUMENT DESIGN FOR OAS DESIGN AND WILL NO SHATTER SHIELDS TO THE RID S7-103 WHICH WAS	OT INCLUDE SHATTER E OAS INSTRUMENTATI	SHIELD. ION WAS TH	ADDITION OF
3. RECOMMENDATION: IF NASA APPROVES RID THIS RID SHOULD ALSO		IMPLEMENTA	TION, THEN
4. IMPACT, IF RECOMMENDATION NOT IMP LOSS OF CONFIGURATION	CONTROL BETWEEN OF	AS AND SMS	· .
	. Mine	F & M (ZV.
	ي	Impact Stateme	Withdrawn :
COMMENTS:		·	
TECHNICAL MANAGE. 1. Olinky		DATE	1/22/16
OAS RID CATEGORIZED 16 WAIT FOR SEPTEMBER 24 PRESENT A SCHEDULE CONSMS (REQ'D TO ORDER 6/ 8. scp action. CAT 16 APPROVAL	FOR SHATTER SHIELD STRAINT. TO PROCES	ORDERING ED WITH DE PACOST I	WOULD SIGN FOR
SCP CHAIRMAN Me Sheets	<u>, </u>	DATE	4/22/16

	DATA / DR	3 1	Q 250		ATTAKHMENT 13 158 St. +.
AREA	VOTO-XXXXXX		ASSUMPTION # A20-	DECISION DATE	REMARKS
01 BLANK			٦	6/24/2	1070-731390 due 9/17/7,
1. 255/)	11/17/9	1
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	DATA / DR		USED		
AREA	VO70-XXXXXX	VLTO-XXXXXX \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	-020 # NOILAU + SO-	DECISION DOTE	REMARKS
02 BLANK	VO70-731460			4/247	Recoined
Oz ASSY			7	1/17/2	1670-73-0291 due 7/34/72
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 	DATA / DE	SAWING TO BE	USED		
AREA		AXXXXX-071V XXXXXX-076V	Assumption # Azo-	DECISION DOTE	N.
03 BLANK	V076-731410				due \$114/76
1, ASS'Y			1	47474	4070-730292 due 9/24/7
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7	•				
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	REMARKS	DUE 4/16/76	1070-730293 due 8/27/71															
	DECUSION DOTE		1/1/4	-														
	Assumption # A20-		1															
AWING TO BE	VOTO-YXXXXX VETO-YXXXXX							٠					;			And the same of th	i.	
MTA / DR	VOTO-XXXXXX	1070-731420			·				·	·		·	·					
-	7	OS BLANK	11 18587				·											

ARE A WOD-XXXXX VL70-XXXXX " ASS-Y "				
	17 17-V-V-VX	Assumption # A20-	2076	REMARKS
			16444	1070-731430 due 8/
		/	6/2471	2010-730294 due 12/3/76
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	DATA / DA	AWING TO BE	USED		
	VB70-XXXXXX	NXXXXX-0LTV XXXXXXX-0L0V	Assumption # A20- OPTION ** \$20-	DECISION DOTE	REMARKS
07 BLANK		VL70-731440			due 6/11/76
II ASSIY			1	42476	1
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	1 MATA / DI	SAWING TO BE		-	•
AREA	VOTO-XXXXXX	AXXXXX-071V XXXXXX-070V	OPTION # 420-	DEUSION DATE	REMARKS
OB BLANIC] - }	429	1070-73 1450 due 10/8/76
" ASSY			/		12/11/3 " 262087-070V
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	BATA / DA	MATA / DRAWING TO BE			
MREA	VOTO-XXXXXX		OPTION # 420-	DCCISION DOTE	REMARKS
09 BLANC	USTO-731400				due 5/20/76
1: ASS 17	· · · .				1070-730297 due 14/17
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•					A CONTRACTOR OF THE PROPERTY O
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HKE H	WID-PAKAKK	VLIU-MXXXX	OPTION # 420-	2076	KE WHKKS
013 BANG			7	6/2476	
1,554 1			\ \	NAC 1	1070-736298 " 4/1/77
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,	I DATA / DA	BE	USED		
AREA	CXXXX-0CIV XXXXXX-0COV	3	Assumption # Azo-	DEUSION DOTE	REMARKS
014 BLANK	VO76-731480				due 6/18/76
1. ASS'Y			/	2/92/2	U070-730299 due 10/22/7
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	JATA / DR	AWING TO BE	USED		#**
AREA	VO70-XXXXX	WYD-XXXXX VLTD-XXXXX	Assumption # Azo-	DECISION DATE	REMARKS
OIS BLANC			1	1626	1070-73/490 due 8/20/76
455A 11			\		v070-730300 due 12/17/76
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	BATA / DA	BENING TO BE	USED		
AREA		VD70-XXXXXX VL70-XXXXXX	Assumption # A20-	DEUSION DATE	REMARKS
OIG BLANK				11.77/9	11010-132000 due 10/1/7
11 ASS 17	:		7	elien	" \$4/4,
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	DATA / DA	3	USED	· ·	•
AREA		AXXXX-061V XXXXXX-060V	ASSUMPTION # A20-	DECUSION DOTE	REMARKS
017 BLAWIC			7	Z/M/h	1670-73 2010
11 ASSJY)		1070.730302 11 3/4/77
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	ATA / DR	AWING TO BE	USED		
	XXXXXX-OLON	YXXXXY-0LT/\ \ XXXXXXY-0L0/\	Assumption # Azo-	DEC1510A DATE	REMARKS
OPP BLANK				4/21/2	wo 10-73 2020 due
1: ASIT			\	9c4249	VOTO-730303 3/18/77
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Assumption # 420- Deusen OFTION # 420- Deusen	 	MTA / DA	36	USED		
1070-31210	AREA				DEUSION DOTE	REMARKS
	FGAZ BLANK					due 4/30/76
	11 ASSY			1	424%	V070-730268 due 9/10/;
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	REMARKS	4070-731050 due A27/76	0250 due 1/14/27	÷												
		L)									-				
<i>:</i> .	DECISION DOTE	6/2472	1/2476				,									
USED	Assumption # Azo-		/					·							Andrew Martin and Control of the Con	
BE	ΧX															
JATA / DR	XXXX-071V XXXXX-070V							·		:						
	- I	FI BLANIC	1: ASS14	•						,					·	

HIEH	YUIU-FAFANA	VLIU-NXKAKA	OPTION : # \$20-	9200	KEMAKKS
FZ BLANK			7	5/1/12	197073 1060 due 12/17/76
1. 1455/			7,	2/1/5	511/12 11 1250 ET-050 MILLS
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HYE H	YU10-YX KAAX	VL10-NXX/XX	OPTION : # \$20-	350510.8 3076	KEMAKKS
F4 BURNIC			7	3/1/15	5/1/7: woo-73/070 due 1/2/77
1. ASS17		·		2/1/15	5/1/74 4070-73.0252 11 4/15/77
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HUEH	VUIU-YKKNKK	VLIO-NXXNXX	OPTION : # \$20-	2076	KEMAKKS
FSAI BLANK			7	424	424 Voro-73
1. ASSY				dun.	4078-730253 due
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AREA	VOTO-XXXXX	XX	ASSUMPTION # A20-	3505 A	REMARKS
RZAI BLANIC		VL 70-731500			due 6/4/76
" ASSY			\	1452/5	12/11 Aug 11/5/
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AREA WORLNAM VITO-KKAKA ASSUMING REGION OF 450- SOURCE AND ASSUMING WORLDS OF AND ASSUMING WORLD OF ASSUMIN		I MATA / DR	3.5	USED		
## (1070-73290) ##SS'Y ##SS'Y				ASSUMPTION # A20-	DEUSION DATE	
435 ¹ / ₁						due 6/25/76
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AREA	AXXXXX-071V \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	VL70-XXXXX	ASSUMPTION # A20-	DECUSION DATE	REMARKS
RIAI BLANK	V070-731280				DUE 4/30/76
RIAL ASS'Y			/	NAN	
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	MATA / DI	SAWING TO BE	USED	
AREA	VOZO-XXXXXX	VELO-XXXXXX VELOCITY VILLA VIL	ASSUMPTION # A20-	DECUSION REMARKS
RC BLANK	W 7073/270			DUE 3/19/76
R6 455'Y			7	`
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	REMARKS	Received		1070-730274 Due 119/76											
	DECISION WOLSON		12/5												
	ASSUMPTION # AZO-		7											a barkete die verrappen des neueropeur plateie dies volunts des desse pessende dessena.	
3.5															
DATA / DRAWING TO	ı	1670-731270											:		
	AREA	LS BUNK	L 5 ASSY		-						:			•	

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LAM BLOWIC				44.71	wo 10-73/260 du
11. 455 17				1/12/2	
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MILH	bold-FA KNAA	VLIV-NAKIKA	08710N : # \$20-	2076	KEMPIKKS
LZAI BLAWK				14/11/9	26/11/12 sue 12/17/76
1: ASC)7		٠, ٥	,	1/44/1	1741 10 20-73 0272 " 4/15/17
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	DATA / DA	BE	USED		
AREA	XYXXX-0LT/\ XYXXXX-0L0\	×	Assumption # Azo-	DEUSION DOTE	REMARKS
LIAZ BLANK			1	3chob	2010-73 1240 due 11/5/76
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AREA			Assumption # Azo- OPTION : # \$20-	DEUSION DOTE	REMARKS
LIAI BUNNIC			7	2/11/6	1070-73/230 ded 9/24/71
11 ASSA	: :		\	11.47	182
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		3451/8	12/11/20		,														
REMARKS	Transition of	V070-731310 due	1070-730278 due 1																
Decision	2076	91/11/9	1/51/5											·					
	020	7	1																
VOTO-XXXXXX VITO-XXXXXX							·		·								 	etha.	
VOTO-XXXXXX	W. W. W. J. W.	-									÷								
AREA		KAMBIANK	11 14557									,	·						

	MATA / DRAWING TO	22			
HHE H	VO 70-FA AAAA		OPTION # # \$20-	DECISION DATE	REMAKKS
C3AI BLANK		W70-731340			due 6/18/76
1, 455/7			\	4/24/2	1070-730281 due 1/26/76
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	DATA / DA	BE	USED		
AREA	CYXXX-0CT/ XYXXXX-0CO	'Y	Assumption # A20-	DECISION DATE	REMARKS
C3A2 BLAWK			j	dilla	2010-73/350 dee 9/10/76
11 ASSY)	76.75	V070-730280 due 11
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	DATA / DA	AWING TO BE			
AREA	VOTO-XXXXX	WYZ-XXXXX VIJO-XXXXX	ASSUMPTION # AZO-	DEUSION NOTE	REMARKS
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0345 BAK	· :		-	2///2	1070-73/360 due 11/12/:
11 ASS'Y			1	12/11/9	vo70-737283
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BUNK	VD70-XXXXXX	 Assumption # A20-	364510A 3076	8
	1070-731570			80/6/h 3no
11 ASS ¹ Y			6/247	1070-7
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	REMARKS	RECEIVED	302																						.
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C3A7 BAVIK			7	14/1/2	1
Y6224 .1 -				1477	1070-73 0285 " 3/25/77
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	JATA / DA	SAWING TO BE	05.50		
	XXXXXX-OLON	VAXXXX-0CTV XXXXXX	UMPTION # A20-	DEUSION DOTE	
FG BLANK				16/81/h	4070-73 1090 due 1924
11 45517			1	16/14/5	1070-73 0255
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		SAWING TO BE	USED		
AREA		AXXXXX-071V XXXXXX-076V	ASSUMPTION # A20-	DECISION DATE	REMARKS
F6 A1 RAWK	¥ VO 74-13 11 00				Received
FLAI ASSY			7	148119	1070
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	DATA / DA		USED	_	
AREA	VB70-XXXXXX	YXXXXX-0C1/ XXXXXX-0C0/	ASSUMPTION # A20-	DECISION DOTE	REMARKS
FLAS GLANK	J010-73/110				due 6/18/76
1. ASS 17				71/6//9	1070-7
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	DATA / DA	BE	USED		
AREA	XXXX-0C1V XXXXXX-0C0V	Ϋ́	Assumption # A20-	DECISION DOTE	REMARKS
FLAT (BLANK)	1670-73/120				26/2/h 300
FU7 (4557)			7	41911	1070-73
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	DATA / DI	DATA / DRAWING TO BE	USED		
AREA	VO70-XXXXX		A SSUMPTION # A20-	DECISION DOTE	REMARKS
FLAB BLANK			7	2/19/2	4/19/1 LOTO-731136 due 19/15/7
11 455%			1	7.16//9	11 PS50ET-050V
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	WIND-FINANNA	MIGHWANNA	OPTION : # \$20-	DATE	KEITHKKS
FT BLANK			,	21/10/19	1870-73/140 due 2/11/77
11 1857			\	12/12/1	11/02/5 " 0320 ET-010V
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	DATA / D	3 €	USED		
AREA	YDD-XXXXX		Assumption # A20-	DECUSION DATE	REMARKS
FIAS BLANK	V070-731150	·			due 6/4/76
// ASSY	1)	4/24/X	1 1
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	JATA / DR	3	USE D		
AREA	XXXXXX-OLOA		ASSUMPTION # AZO-	DECISION DATE	REMARKS
FTAT BLANK		07/182-927/			due (126/76
1: ASSIY			\	45.47.	0201
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	DATA / DA	AWING TO BE	USED		•
AREA	YXXXXX-0CT/\ XXXXXX-0C0\	YXYXXX-027/	OPTION # 420-	DEUSION 3076	REMARKS
FB BLANK				4574	v670-731170 due 9/3/76
11 435/7			1	42.54	
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	DATA / DA	2	USED	·	
AREA	VO70-XXXXX		ASSUMPTION # A20-	DECISION DOTE	RE
F844 BUMK	VO74-731180		-		due 4/23/76
" ASS'Y			7	6/25/	6/24 1000-730264 due 8/30/2
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MREA		KANUNG 10 GE	USED		-
	l	1070-XXXXX V170-XXXXX	Assumption # A20-	DECISION DATE	R
FBAS BLANK		UL70-731190			due 6/18/76
" ASSY			/	6/2/16	1070-7
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	JATA / DA	ANING TO BE	USED		
AREA	VO70-XXXXXX	VYXXXX-0CT/\ XXXXXX-0C0/	ASSUMPTION # A20-	DECISION DATE	REMARKS
F847 BLAUK	Vo70-73 1200		-		due 5/7/16
" A55"Y	,		7	415/4	VO30-
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	DATA / DA	141	USED		
AREA	ł	AXXXX-071V XXXXX-070V	ASSUMPTION # A20-	DEUSION DATE	REMARKS
F8 AB BLANK	012/82-0201				due 6/11/76
10 Ass'Y			7	61,5th	1670-730267 due 10/15/76
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HIEH	YUNU-PÄKNÄK	VLIU-FXXNXA	09710N . # 620-	PATE DATE	KEMAKKS
FWO, CONSOLE			\	11/1/6	1070-730020 due 8/5/70
i.		-			
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L.H. CONSOLE				11/1/6	1070-730021 due 8/19/77
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R.H. CONSOLE INSTALL)	11/1/6	1070-730022 due 9/2/77
. CENTER GONSOLE			7	7/13/12	1070-73 0023 due 8/5/77
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OWHO CONSOLA				1,1,1,	
				20002	7717
ROTHTOWAL			USE EXSISTING		
HAND CONTROL			WI DATA		111119 mg 570081-0101

	DATA / DI	SAWING TO BE			
AREA	VO70-XXXXXX	VL70-XXXXXX VL70-078Y	Assumption # A20- D	DECISION NOTE	REMARKS
QUERHERD &	-	7635286777			Pece wed JATA
EYERBO		1670-333581			Received DATA
STEUCTURE					
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	S >	Jue 6/4/26				·														
· -	REMARKS																			
		DR045	,			•														
	DEUS10A DATE	1/4									·									
	A20-										·									
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USED	Assumption #											·	·		·					
		333330	1331												A. G. 1100					+
7 9	2-XXX/	0-33	0- 333						·											
9010	VD70-XXXXX VL70-XXXXX	VC 20-	VC 20-										-							
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ATA	2-XXX													-						
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	AREA	SiDE	CONSI	(1H & RH)				·										:		

	DATA / DI	3	USED		••		
AREA	VO70-XXXXXX		ASSUMPTION # A20-	DECISION DOTE		REMARKS	
CIRCUIT		14-70-339605		12/5	D 8695	Due 5/2/	2/
८८ च्य ४ ज्य		407525-077		12/5			12/5
STRUCTURE		VC 70-333802		5/2/			2/5/
(LH, 4 84KH)		VL 20-333 803		12/5	2 2000 C		12/5
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	REMARKS	Received			Received												
	DECISION DATE	,				·											
::	ASSUMPTION # AZO-										or the state of the						
36	-	1670-333525	453555 - OC X	UC 70-333527	VC 10- 333528												
MATA / DR	VB70-XXXXXX												-				٠
	AREA	Blow out Pucs	& STRUCTURE														

HILH	YUJU-YA KAAK	VL10-NXXXXX	07110N # \$20-	DA76	KEMAKKS
Central Console		VL 20-333290		91.9Th	
		1670-3>3291		Skan	
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	DATA / D	RAWING TO BE	USED		
AREA	VB70-XXXXXX	VETO-XXXXXX VETO-XXXXXX	ASSUMPTION # AZO-	DECISION DATE	REMARKS
OR AIR Condition	5.4				
out Lets		17 70-335160		447.	
		1/ 70-333161		74315	
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	DATA / DR	36	USED		#1 ****
AREA	XXXXXX-OCON		ASSUMPTION # A20-	DECISION DATE	REMARKS
Stales wield			/	5/1/4	ASSUME SAME AS
HC SUPPORT			· /	5/1/26	ASSUME
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	ATA / DA	AWING TO BE	OSED	-	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
AREA	VD70-XXXXX	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	ASSUMPTION # A20-	DECISION DATE	REMARKS
FWD SHEEL		-			SAME AS OAS
FWD FL. FRM					SAME AS OAS
FLID FC PVCS					45
MDC FWD ST					SAME AS OAS
RUDDER POLS				·	SAME AS OAS
SEAT STR	·				4
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hite H	VUTU-FÄKÄK	VT10-1441XX	OFTION # \$ 20-	DATE	KEMPAKS
SAC CONTEST					
JRAW WAS	Ac 432-0222			5/106	Released NoT in house
Eventshud.	•	•			
Meder, TAPE	MC432-0232			51,04	Released Not in house
X-Pointer	AC432 - 0233		Use GFE supplied LEM		
			Indicater		
Round meter	MC432 - 0237			1/1//5	Not Reliand Du. Rol 4/23/
Motes Versikal	MC 432-0238			1 1/1/5	Not Reloased Due Red 4/25/7
				 	
LIGHT ASSY	Mc434-0068		SAME AS 101	1	
C+W ANNOW.	Mr434- 2069.			213015	
ANNE DISPLAY	M434 - 0.70		1	1412/5	
AIRE WALNUS					
אי אי אי אי	MC434-0073	٠		5/24/X	
Single event Annum	Mc 434-0075			7/Hd/S	
ELOOUTE HIS	Mc 434-0078			5/1/5	Stac Roberte NoT in house
Computer	Mc 434-0080			14945	

HAEH	WIU-FAXAAX	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	-074 # World	370C	KEMAKKS
Spe Con 706					
DRAWINS.			, , , , , , , , , , , , , , , , , , , ,		
thumburnel sw.	mc 452-0134			5/1/20	Spec Release NoT in house
Postbotton sw	ME 452 -0.60			5/24/76	
Switch Pust butten	ME 452 - 00 61			5/2476	
70956 Suitch	1010 - 15h JW			2411/5	SPec Polise. Not in hous
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